6-2021

Positive Symptoms of Schizophrenia and Suicide: A Systematic Review of Gender, Race/Ethnicity, and Premorbid IQ Variables

Susan Diann Paschall

Positive Symptoms of Schizophrenia and Suicide: A Systematic Review of Gender, Race/Ethnicity, and Premorbid IQ Variables

Susan D. Paschall, M.S., M.A.

Florida School of Professional Psychology at National Louis University

Christina D. Brown, Psy.D.
Chair

Elizabeth M. Lane, Ph.D.
Member

A Clinical Research Project submitted to the Faculty of the Florida School of Professional Psychology at National Louis University in partial fulfillment of the requirements for the degree of Doctor of Psychology in Clinical Psychology.

Tampa, Florida

April 15th, 2021

The Doctorate Program in Clinical Psychology
Florida School of Professional Psychology
at National Louis University

CERTIFICATE OF APPROVAL

Clinical Research Project

This is to certify that the Clinical Research Project of

Susan Diann Paschall

has been approved by the
CRP Committee on April 15th, 2021
as satisfactory for the CRP requirement
for the Doctorate of Psychology degree
with a major in Clinical Psychology

Examining Committee:

Christina D Brown Psy.D.

Committee Chair: Christina D. Brown, Psy.D.

Elizabeth M. Lane, PhD

Member: Elizabeth M. Lane, Ph.D.

Abstract

Schizophrenia is an exceptionally debilitating mental disorder. Its effects permeate all facets of psychosocial functioning and it is associated with premature mortality. As such, suicide is of clinical concern. Positive symptoms such as hallucinations and delusions may influence the risk of suicide among individuals diagnosed with schizophrenia, but additional research is necessary, as the limited literature on this topic is dated and includes heterogeneous results. Early recognition of and intervention for suicide risk factors, such as the presence of positive symptoms of psychosis, may reduce mortality rates for individuals with schizophrenia. The present literature review examined the role of gender, race and ethnicity, and intelligence quotient (IQ) variables in the association between positive symptoms and suicide, revealing current knowledge gaps and highlighting areas for future research. For mental health clinicians, this work suggests a need for culturally competent care, comprehensive assessment measures, address vulnerabilities and suicide risk factors in this population. Furthermore, in future work, researchers should use larger sample sizes, practical study designs, balanced participant groups, and U.S. participants.

Keywords: schizophrenia, suicide, positive symptoms, gender, race, ethnicity, premorbid intelligence quotient

POSITIVE SYMPTOMS OF SCHIZOPHRENIA AND SUICIDE: A SYSTEMATIC REVIEW OF GENDER, RACE/ETHNICITY, AND PREMORBID IQ VARIABLES

DEDICATION

First and foremost, I dedicate this publication to my mother, whose unconditional love and steadfast belief in my abilities guided this project and continues to guide my current and future work as a clinical psychologist. I would also like to dedicate this publication to an individual whose path crossed mine during young adulthood. They gave me hope for a more favorable prognosis among a group of individuals who were once considered hopeless.

ACKNOWLEDGEMENTS

I would like to thank my chair, Dr. Christina Brown, who instructed, mentored, and supported me throughout my doctoral program experience, which includes this project. I have learned so much, from your anecdotal lecture style in the classroom to your depth of knowledge and clinical expertise regarding severe mental illnesses, such as schizophrenia. Your strengths-based approach to teaching and mentorship has been encouraging on my journey to become a clinical psychologist. I also wanted to thank my co-chair, Dr. Elizabeth Lane, whose expertise in all areas related to neuropsychology, research, and statistics has helped me better understand and appreciate clinical research. I will be forever grateful for the individual instruction you provided regarding complex class assignments, processes, and topics. Your ability to translate scientific matters into clinical practice has been, and continues to be, instrumental to my endeavors as a clinical researcher in training. Finally, I wanted to give a special thanks to Dr. Gary Howell for the rigorous yet comprehensive diversity training I received from him, which continues to push me to be aware of my own biases, to be open to learning about other cultures, and to advocate for marginalized client groups in my development as an informed and culturally competent mental health clinician.

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

CHAPTER I: INTRODUCTION

There are many factors that increase suicide risk among individuals with schizophrenia. Positive symptoms, which are among the most common, have received little scholarly attention with regard to how they affect suicide risk among this vulnerable population. Due to the known differences in gender, race/ethnicity, and premorbid IQ among individuals with schizophrenia, it may also prove beneficial to further explore these variables as they relate to suicide risk.

Schizophrenia Definition and Associated Factors

Schizophrenia is a rare yet serious thought disorder that includes positive and negative symptoms of psychosis (American Psychiatric Association, 2013). Historically, many definitions of schizophrenia have existed. This paper will use the most commonly accepted modern definition based on the fifth edition of the American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM-5; 2013). The DSM-5 defines schizophrenia criteria as:

A. Two (or more) of the following symptoms, each present for a significant portion of the time during a one-month period (or less if successfully treated). At least one of these symptoms: delusions, hallucinations, disorganized speech (e.g., frequent derailment or incoherence). Other symptoms include grossly disorganized or catatonic behavior or negative symptoms (i.e., diminished emotional expression or avolition).
B. For a significant portion of the time since the onset of the disturbance, level of functioning in one or more major areas, such as work, interpersonal relations, or self-care, is markedly below the level achieved prior to the onset (or when the onset is in childhood or adolescence, there is failure to achieve expected level of interpersonal, academic, or occupational functioning).
C. Continuous signs of the disturbance persist for at least 6 months. This 6-month period must include at least 1 month of symptoms (or less if successfully treated) that meet Criterion A (i.e., active phase symptoms) and may include periods of prodromal or residual symptoms. During these prodromal or residual periods, the signs of the disturbance may be manifested by only negative symptoms or by two or more symptoms listed in Criterion A present in an attenuated form (e.g., odd beliefs, unusual perceptual experiences).

D. Schizoaffective disorder and depressive or bipolar disorder with psychotic features have been ruled out because either 1) no major depressive or manic episodes have occurred concurrently with the active-phase symptoms, or 2) if mood episodes have occurred during active-phase symptoms, they have been present for a minority of the total duration of the active and residual periods of the illness.
E. The disturbance is not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition.
F. If there is a history of autism spectrum disorder or a communication disorder of childhood onset, the additional diagnosis of schizophrenia is made only if prominent delusions or hallucinations, in addition to the other required symptoms of schizophrenia, are also present for at least 1 month (or less if successfully treated). (APA, 2013, p. 99)

Symptoms of schizophrenia are often categorized as positive or negative. *Positive symptoms* are those one would not typically experience, such as auditory or visual hallucinations. *Hallucinations* are misperceptions related to any of the five senses (sight, sound, smell, taste, or touch), such as seeing an object, person, or apparition that others do not see or hearing voices or sounds that are not really there (APA, 2013). Another type of positive symptom is a *delusion*, which is a belief that is untrue or impossible, such as the belief that others want to harm the individual or that special messages are being sent to the individual through the television (APA, 2013). *Disorganized thoughts*, which are a type of positive symptom, are unrelated or disconnected thoughts or ideas manifested in the form of disorganized speech, such as stating random words, repetition of words or phrases, or non-words or sounds only the individual comprehends (APA, 2013). *Negative symptoms* are deficits or experiences that are reduced, missing, or impaired, such as flat affect, impoverished speech, or amotivation (APA, 2013).

Cultural factors should be distinguished from psychotic symptoms, such as religious or spiritual beliefs in communicating with deceased individuals, hearing God's voice, or obeying a deity's commands (APA, 2013). Other cultural phenomena include but are not limited to lack of eye contact or fear of dominant culture members (APA, 2013).

Schizophrenia affects approximately 1% of the population globally. Several gender differences have been well established in the literature. Schizophrenia tends to affect men earlier in the lifespan than women (APA, 2013). Men tend to have a worse prognosis, including poor social, occupational, and educational functioning, due to an earlier onset of the disorder, and younger men have an increased risk for suicide (APA, 2013). A later onset of the disorder among women usually results in better premorbid functioning related to the establishment of marital relationships and the completion of higher education (APA, 2013). Women are more prone to mood-related symptoms in the early phases of the disorder, with more psychotic symptoms in subsequent phases (APA, 2013).

Historical Development of Schizophrenia Diagnostic Criteria

Nosology

One of the first references to schizophrenia was by Emil Kraepelin, a German psychiatrist, who used the term *dementia praecox* in the fourth edition of his psychiatry textbook in 1893. Dementia praecox translates to premature dementia or premature deterioration of the mind (Kraepelin, 1893). Kraepelin never established a set of diagnostic criteria for dementia praecox. Instead, through observations of his individual patients, he was able to identify patterns of developing this disorder at an early age as well as its poor outcomes in order to establish a diagnosis (Kraepelin, 1893).

In 1908, Eugene Bleuler, a Swiss psychiatrist, coined the term *schizophrenia*, which literally translates to split mind (Bleuler, 1911). Unlike the concept of a split personality, Bleuler's idea of a split mind was related to a split or separation between one's feelings and thoughts (Bleuler, 1911), such as loose-associations.

Symptomatology

Bleuler's terms for positive and negative symptoms were fundamental and accessory symptoms (Bleuler, 1911). Fundamental symptoms, or the "Four As," according to Bleuler, were associational disturbances, such as loose-associations or tangential thought processes; affective disturbances, such as flat or inappropriate affect; autism, such as a distorted reality; and ambivalence, such as an inability to make decisions (Bleuler, 1911). Accessory symptoms included delusions, hallucinations, catatonia, somatic symptoms, and impaired speech and handwriting (Bleuler, 1911).

In 1939, Kurt Schneider, a German psychiatrist, influenced schizophrenia diagnostic criteria through the development of what he referred to as *first rank* and *second rank symptoms* (Schneider, 1939). First rank symptoms consisted of delusions related to mind and body control and audio hallucinations in third person, while second rank symptoms consisted of paranoid and persecutory delusions and auditory hallucinations in second person (Schneider, 1939).

Evolution of Diagnostic Manual Inclusion

Following the Second World War, the World Health Organization (WHO) opted to include a section for mental disorders (section V) in its sixth edition of the International Statistical Classification of Diseases (ICD-6; WHO, 1949). Three years later, the United States published the first edition of the Diagnostic and Statistical Manual (DSM), which consisted of only psychiatric disorders and were collaborative efforts between the WHO's ICD-6 and the American Psychiatric Association (APA, 1952). Both manuals included schizophrenia, but the first DSM referred to it as *schizophrenic reactions* under the Psychotic Disorders section (APA, 1952). The first DSM defined schizophrenic reactions, a psychoanalytic concept, as "fundamental disturbances in reality relationships and concept formation with associated

affective, behavioral, and intellectual disturbances marked by a tendency to retreat from reality, regressive trends, bizarre behavior, disturbances in the stream of thought, and delusions" (APA, 1952, p. 26).

It was not until the second edition of the DSM, which the APA based on the ICD-8 (WHO, 1965), that the term *schizophrenia* replaced schizophrenic reactions and was listed as a mental disorder under the Psychoses not Attributed to Physical Conditions section, along with nine subtypes (APA, 1968). More psychoanalytic underpinnings were evident in the second edition of the DSM with the paranoid subtype, which implied the defense mechanism of projecting onto others, and the childhood subtype, which is similar to Carl Jung's concept of individuation (Jung, 1968), where a child is unable to develop a separate identity from its mother (APA, 1968).

In light of inconsistent and unreliable psychiatric diagnoses in previous diagnostic systems, such as the DSM and DSM-II, psychiatric researchers developed a third type of diagnostic system, referred to as the Research Diagnostic Criteria (RDC; Spitzer et al., 1978). The RDC was initially part of a research project on depression by the National Institute of Mental Health (Spitzer et al., 1978). However, other disorders, including schizophrenia, were eventually added. The RDC was the first diagnostic manual to separate schizoaffective disorder from schizophrenia (Spitzer et al., 1978), which would continue in subsequent DSMs, beginning with the third edition (APA, 1980).

The first two DSMs took more of a descriptive approach to diagnosis, similar to Emil Kraepelin's approach, and it was not until the third edition of the DSM that a categorical and multiaxial diagnostic system was established (APA, 1980). In the DSM-III, which contained collaborative efforts with the ICD-9 (WHO, 1978), schizophrenia received its own category,

Schizophrenic Disorders, which included five subtypes: paranoid, disorganized, catatonic, mixed, and residual (APA, 1980). The subtypes would remain in three subsequent DSM revisions (APA, 1987; APA, 1994; APA, 2000). In order to increase the reliability of the schizophrenia diagnosis, authors of the DSM-III began using structured interviews, such as the Present State Exam (Wing et al., 1967) and the Current and Past Psychopathology Scales (Endicott & Spitzer, 1972), which increased the agreement between mental health professionals' diagnoses to a kappa coefficient of 0.81 (Davison & Neale, 1975). In the DSM-III-R, schizophrenia replaced the previous schizophrenic disorder term, and delusional disorder replaced paranoid disorder (APA, 1987).

WHO developed the ICD-10 (WHO, 1992), which subsequently influenced the DSM-IV and DSM-IV-TR (APA 1994; APA, 2000). All three diagnostic systems required active phase symptoms, such as delusions and hallucinations, for a minimum of one month (WHO, 1992; APA, 1994; APA, 2000). However, the ICD-10 only required the duration of any symptoms to be no more than one month to warrant a diagnosis (WHO, 1992). The DSM-IV and DSM-IV-TR required any of the symptoms to continue for at least six months before diagnosis (APA 1994; APA, 2000). In DSM-IV-TR, Criterion B required social, occupational, or self-care functioning to be impaired (APA, 2000), but the ICD-10 had no such requirement (WHO, 1992). Finally, the most current, fifth edition of the DSM listed schizophrenia under the section Schizophrenia Spectrum and Other Psychotic Disorders (APA, 2013).

In comparing the DSM-5 with its predecessor, the DSM-IV-TR (APA, 2000), the symptom requirements for Criterion A have not changed. One major difference, however, is that DSM-IV-TR (APA, 2000) added a proviso that only one of the five symptoms was required if the individual reported bizarre delusions or auditory hallucinations of a

running commentary or two voices in conversations. This proviso was removed for the DSM-5 (APA, 2013). The second major difference was that the DSM-5 (APA, 2013) system eliminated the diagnostic subtypes (paranoid, disorganized, catatonic, undifferentiated, and residual) that the four previous versions of the DSM (DSM III (APA, 1980), DSM III-R (APA 1987), DSM IV (APA 1994), and DSM IV-TR (APA, 2000) used to categorize individuals with schizophrenia.

WHO published the ICD-11 in 2018, which, similar to the DSM-5 (APA, 2013), omitted the subtypes for schizophrenia (WHO, 2018). However, unlike the DSM-5 (APA, 2013), the ICD-11 placed schizophrenia under the category of Schizophrenia or other primary psychotic disorders (WHO, 2018). ICD-11 also created an additional category called Symptomatic manifestations of primary psychotic disorders, which included codes for individual symptoms, such as positive, negative, depressive, manic, psychomotor, and cognitive (WHO, 2018).

Schizophrenia and Suicide

Individuals in the U.S. with a schizophrenia diagnosis die prematurely up to 3.5 times earlier than the general population (Olfson et al., 2015). Many factors increase early mortality among individuals with schizophrenia, including chronic medical conditions such as heart disease (Sweeting et al., 2013), cancer (Crump et al., 2013), and lung disease (Copeland et al., 2007). Among individuals with schizophrenia, between 5 and 6% die from suicide, while 20% attempt suicide (APA, 2013).

The National Institute of Mental Health (NIMH) defines *suicide* as "death caused by self-directed injurious behavior with an intent to die as a result of the behavior," a *suicide attempt* as "a non-fatal, self-directed, potentially injurious behavior with an intent to die as a result of the behavior; might not result in injury," and *suicidal ideation* as “thinking about, considering, or

planning suicide" (NIMH, 2021, Definitions section). Suicide is the 10th leading cause of deaths among people aged 15 to 24 in the U.S. general population (Drapeau & McIntosh, 2017) and is one of the leading causes of unnatural deaths in people aged 15 to 24 with schizophrenia (Lin et al., 2018).

Many factors increase risk for suicide among individuals with schizophrenia, including alcohol use and abuse (McLean et al., 2012), use and abuse of illicit substances (Østergaard et al., 2017), increased insight or awareness into one's illness (Umut et al., 2013), symptoms related to depression (Fleischhacker et al., 2014), childhood trauma (Hassan et al., 2016), and negative or deficit symptoms (Yan et al., 2013). Additionally, positive (or active phase) symptoms, especially hallucinations and delusions, are significant suicide risk factors in adults with a schizophrenia diagnosis (Fialko et al., 2006), but they have been less studied than other schizophrenia symptoms.

Suicide risk among the general population differs from suicide risk among individuals with schizophrenia. In the U.S. general population, 2.5% of all suicide deaths are among men, and 0.8% of all suicide deaths are among women; however, women attempt suicide three times more often than men (Drapeau & McIntosh, 2017). Also, 1.7% of all suicide deaths are among Whites, and 0.8% are among African-Americans (Drapeau & McIntosh, 2017). Finally, low IQ is associated with a high suicide risk (Batty et al., 2010). These same variables (gender, race/ethnicity and premorbid IQ) among individuals with schizophrenia should be further explored since their suicide rates exceed individuals in the general population, especially in individuals with schizophrenia who experience positive symptoms.

The Relationship Between Suicide and Positive Symptoms of Schizophrenia

Positive symptoms of schizophrenia are additional symptoms characterized by experiences beyond those considered normal, such as audio or visual hallucinations, delusions, and disorganized thoughts or speech (APA, 2013). Positive symptoms are likely to cause patients increased amounts of stress and anxiety, especially in the early stages of schizophrenia (Bornheimer & Jaccard, 2017). Additionally, positive symptoms are more closely associated with suicidal ideations and completed suicides, as patients attempt to rid themselves of positive symptoms (Bornheimer & Jaccard, 2017).

A study by Yan et al. (2013) investigated the relationship between positive and negative symptoms, suicide attempts, and suicidal ideation. The researchers recruited participants from a large, randomized, controlled study among individuals with schizophrenia registered with outpatient mental health clinics in Beijing and used a numbers table to randomly select subjects (Yan et al., 2013). Of the original 13,986 individuals with schizophrenia, the Yan et al. (2013) study sample consisted of 540 individuals with schizophrenia (267 male and 273 female participants) who were taking either first or second generation antipsychotics or clozapine.

Results indicated that participants with current suicidal ideation had higher rates of positive symptoms ($M = 11.4$, $SD = 3.6$) versus participants with no current suicidal ideation ($M = 10.1$, $SD = 3.2$, $t(538) = -3.6$, $p < 0.001$; Yan et al., 2013). Participants with current suicidal ideation had even higher rates of negative symptoms ($M = 13.2$, $SD = 3.1$) compared to those with no ideation ($M = 12.3$, $SD = 3.7$, $t(538) = -2.5$, $p = 0.01$; Yan et al., 2013). Participants who reported a suicide attempt at some point during their lifetime had slightly higher rates of positive symptoms ($M = 10.5$, $SD = 3.3$) compared to those who never attempted suicide ($M = 10.3$, $SD = 3.3$; $t(538) = -3.6$, $p = 0.8$), but the differences were not statistically different (Yan et al., 2013).

There were no differences between participants who reported negative symptoms and a lifetime suicide attempt (M = 12.5, SD = 3.7) and those with negative symptoms and no suicide attempts (M = 12.5, SD = 3.6; Yan et al., 2013). Therefore, lifetime attempts did not appear to be related to higher rates of negative symptoms (Yan et al., 2013).

The Yan et al. (2013) study had a few limitations, such as problems with generalizability outside of the sample of interest, which consisted of participants from Beijing, China, who sought treatment in an outpatient setting. Also, participants received psychotropic medications, which could alter symptomatology and skew study results (Yan et al., 2013). Individual positive symptoms endorsed by participants were not reported since they were reported as Positive and Negative Symptom Scale (PANSS; Kay et al., 1987) scores, so it is unclear which positive symptoms specifically were associated with suicide attempts or ideation. Another limitation is that there were unequal numbers of male and female participants, so the results may not be generalizable to most men and women with schizophrenia (Yan et al., 2013). There were far more participants who lived in urban areas as compared to rural areas, so those who lived in rural areas may have been excluded from the study, which could increase the likelihood of a non-response bias (Yan et al., 2013). The results from the study by Yan et al. (2013) suggest a link between positive symptoms and suicide risk (lifetime suicide attempts and current suicidal ideation) among individuals with schizophrenia.

Fox et al. (2004) examined 32 patients with schizophrenia to assess how thought processes, such as perceptions of self and others, impacted compliance with command hallucinations, a type of auditory hallucination that instructs individuals to act in a certain way and may lead to self-harm or harm-other type of behaviors (APA, 2013). The sample included approximately 41% of participants from a forensic population and 59% from a non-forensic

psychiatric population (Fox et al., 2004). About 31% of participants were women, and 69% were men (Fox et al., 2004). All participants had a schizophrenia diagnosis according to the DSM-IV (APA, 1994), two of whom also had a personality disorder, and all participants reported command hallucinations (Fox et al., 2004). The researchers divided participants into groups based on whether they complied or did not comply with command hallucinations and whether as a result of those commands they harmed themselves or others (Fox et al., 2004). Results indicated that 75% of participants complied with violent types of commands and 79% complied with commands to self-harm, which included suicidal gestures, such as hanging and overdose (Fox et al., 2004). This suggested that the positive symptom of command hallucinations, in particular, may be a significant risk factor for suicide or self-harm.

This study had limitations. First, the sample size was small, which reduces the study's statistical power (Fox et al., 2004). The results of the study only relate to individuals with auditory or command hallucinations and not other types of hallucinations, such as visual or tactile hallucinations or other positive symptoms (Fox et al., 2004). The results also only relate to individuals who reported experiencing command hallucinations to harm self or others, so they may not be generalizable to those who experience more benign command hallucinations (Fox et al., 2004). The results of the study only relate to individuals who were receiving or had received treatment at some point, making the results not generalizable to individuals who were not or had never received mental health treatment (Fox et al., 2004). Finally, another limitation is the reliance on self-report questionnaires; as such, answers collected may be biased, as some patients may wish to either downplay or exaggerate their respective auditory hallucinations or answer in ways they believe the researcher may prefer or not prefer them to answer (Fox et al., 2004). Even within the limitations of the research completed by Fox et al. (2004), they were able to suggest a

link between specific types of positive symptoms, violent command hallucinations, and influences on both self-harm and suicide-related behaviors among a small group of individuals with schizophrenia.

Simms et al. (2007) investigated acute patients in the U.K. with schizophrenia who reported a history of self-harm (n = 17) and no history of self-harm (n = 16). The researchers recruited the study participants from psychiatric hospitals during their inpatient stays (Simms et al., 2007). Participants were diagnosed with schizophrenia according to DSM-IV-TR (APA, 2000) criteria by psychiatrists and received psychotropic medications during the study (Simms et al., 2007). About 66.7% of the study participants were men and 33.3% were women (Simms et al., 2007). Forty-eight percent of study participants endorsed abusing substances historically, and participants reported smoking a mean of 19.3 (SD = 14.5, range 0-50) cigarettes per day (Simms et al., 2007).

Fifteen (45.5%) of the 33 participants reported experiencing auditory hallucinations, and nine of the 15 (60%) reported self-harm behaviors (Simms et al., 2007). Participants who had engaged in self-harm and heard auditory hallucinations reported more significant malevolent or negative beliefs about the voices (z = -2.25, p = .024), and they reported trying harder to ignore the voices, compared to participants who had experienced auditory hallucinations and did not have a self-harming history (Simms et al., 2007). Suicidal thoughts were significantly higher in people who experienced both auditory hallucinations and self-harm (z = -2.05, p = .041; Simms et al., 2007). The study found significant relationships between suicide intent and malevolent beliefs about the voices (r(31) = .66, p < .05), as well as suicidal intentions and omnipotence (i.e., how powerful participants believe the voice is; r(31) = .76, p < .05; Simms et al., 2007).

The study also found a significant correlation between suicidal intentions and degree of suicidal ideation (r (31) = .69, $p < .05$; Simms et al., 2007).

Limitations for the research completed by Simms et al. (2007) included the small sample size ($N = 33$), which reduced the reliability of the study's results and increased the likelihood of non-response bias among participants who were unable to partake in the study. Another limitation for this study included the nature of a cross-sectional design, which does not allow for the exploration of causal relationships (Simms et al., 2007). Further, the study only had a sample comprised of patients who were in mental health treatment and, as such, may not be generalizable to individuals with schizophrenia outside of treatment (Simms et al., 2007). Participants were from the U.K., so the results may not be generalizable to individuals outside of the U.K. (Simms et al., 2007). Some participants endorsed substance abuse and cigarette use, so it is unclear if either of these factors contributed to suicidal thoughts or behaviors (Simms et al., 2007). The assessment measures used were self-report questionnaires, so participants may have responded in a manner they believed the researcher preferred them to respond, or they may have misunderstood the questions, either of which would have invalidated the assessment results. Finally, auditory hallucinations were the only type of hallucinations or positive symptoms explored (Simms et al., 2007). Regardless of the limitations, Simms et al. (2007) found a significant correlation between auditory hallucinations and the participants' negative beliefs about the voices behind the hallucinations, which the study indicated were related to suicidal thoughts. Additionally, the study showed auditory hallucinations influenced one's intentions about following through with the suicidal behavior (Simms et al., 2007).

In another study, Baca-Garcia et al. (2005) studied 25 patients with schizophrenia and 107 patients with major depressive disorder to explore characteristics of suicide attempts

between the two diagnostic groups. Almost half (48%) of the population met criteria for both schizophrenia and depression (Baca-Garcia et al., 2005). According to the DSM-5, major depressive disorder significantly increases suicide risk (APA, 2013). The DSM-5 diagnostic criteria stipulates that "five or more of the following symptoms must be present during the same two-week period and represent a change from previous functioning; at least one of the symptoms are either depressed mood or loss in interest or pleasure" (APA, 2013, p. 160):

> (1) Depressed mood most of the day, nearly every day… (2) Markedly diminished interest or pleasure… (3) Significant weight loss when not dieting or weight gain… (4) Insomnia or hypersomnia… (5) Psychomotor agitation or retardation… (6) Fatigue or loss of energy… (7) Feelings of worthlessness or excessive or inappropriate guilt… (8) Diminished ability to think or concentrate, or indecisiveness… (9) Recurrent thoughts of death… (APA, 2013, pp. 160-161)

Study results indicated that 54% of participants with schizophrenia attempted suicide at some point during the previous year (Baca-Garcia et al., 2005). More specifically, 13% of participants with schizophrenia attempted suicide while experiencing command hallucinations, and 13% also attempted suicide while experiencing delusions (Baca-Garcia et al., 2005).

The results of the study completed by Baca-Garcia et al. (2005) are susceptible to several limitations. First, the sample size was sufficient ($N = 132$), but there were a small number of participants with schizophrenia ($n = 25$), so the statistical power related to the schizophrenia results was low (Baca-Garcia et al., 2005). Further, 48% of the schizophrenia sample had a comorbid diagnosis of major depressive disorder, so the sample was not pure (Baca-Garcia et al., 2005). Therefore, results related to schizophrenia participants could have additional reasons for increased suicide risk (Baca-Garcia et al., 2005). Next, the study participants were from Spain, so the study results may not be generalizable to individuals with schizophrenia in other geographic areas (Baca-Garcia et al., 2005). Also, the researchers recruited participants from a

hospital emergency room, so the study did not include individuals with schizophrenia who did not receive treatment in a hospital setting (Baca-Garcia et al., 2005). Although it was a nominal finding, the Baca-Garcia et al. (2005) study suggested that positive symptoms, such as command hallucinations and delusions, may have contributed to suicide attempts among a small number of individuals with schizophrenia. However, due to almost half of these individuals also having a comorbid diagnosis of major depressive disorder, it is unclear whether participants with schizophrenia had an increase in suicide risk due to command hallucinations or depression (Baca-Garcia et al., 2005).

Two studies compared patients with schizophrenia to patients with other psychological disorders to explore whether early symptoms, including positive symptoms, could predict suicidal thoughts and behaviors later in life (Kaplan & Harrow, 1996, 1999). In the first study, Kaplan and Harrow (1996) assessed 70 patients with schizophrenia and 97 patients with depression, all of whom were hospitalized in an acute psychiatric facility in the U.S. and later assessed at follow-up periods (2 years and 7.5 years) to determine the potential impact of positive and negative symptoms on subsequent suicide. Forty-eight percent of all participants (schizophrenia and depression) were men and 52% were women (Kaplan & Harrow, 1996).

At the 7.5-year follow-up, 72% of the schizophrenia participants were taking psychotropic medications and 28% were unmedicated (Kaplan & Harrow, 1996. Among the depression participants, 70% were unmedicated, while 30% were taking antidepressants or other psychotropic medications (Kaplan & Harrow, 1996). Results revealed that among the 40 individuals with schizophrenia who reported psychotic activity at the 2-year follow-up, 32% exhibited suicidal behaviors at the 7.5-year follow-up (Kaplan & Harrow, 1996). By comparison, only 10% of schizophrenia patients with no psychotic activity at the 2-year follow-up later

demonstrated suicidal behavior ($x^2 = 4.63$, df = 1, $p < .05$; Kaplan & Harrow, 1996). Twenty-five percent of the eight individuals with schizophrenia who did not take medications at the 2-year follow-up demonstrated suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996). However, none of the unmedicated depression participants at the 2-year follow-up demonstrated suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996). Thirty-four percent of individuals with schizophrenia who exhibited positive symptoms at the 2-year follow-up and were on medications demonstrated suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996). However, only 17% of depressed participants who were medicated at the 2-year follow-up demonstrated suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996). None of the results that controlled for medications were statistically significant (Kaplan & Harrow, 1996).

When the researchers observed patients with schizophrenia who reported hallucinations at the 2-year follow-up, 36% were at higher risk of demonstrating suicidal behaviors later in life compared to patients with schizophrenia who denied positive symptoms (11%; $x^2 = 5.52$, df = 1, $p < .05$; Kaplan & Harrow, 1996). Among the depression participants, the study did not find that hallucinations at the 2-year follow-up were related to subsequent suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996). Thirty-two percent of individuals with schizophrenia who reported symptoms of delusions at the 2-year follow-up had higher risks of having suicidal thoughts or behaviors later in life, as compared to 12% of individuals with schizophrenia who did not have delusional symptoms (x^2 (1, $N = 167$) = 3.83, $p < .05$; Kaplan & Harrow, 1996). In neither the schizophrenia ($x^2 = 0.44$, $df = 1$, Fisher's exact $p < .51$) nor the depression ($x^2 = 0.20$, $df = 1$, Fisher's exact $p < .54$) participant groups did those who experienced a thought disorder at the 2-year follow-up exhibit risk of subsequent suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996).

With regard to experiencing traditional negative symptoms (poverty of speech or flat affect) at the 2-year follow-up, the study found that neither individuals with schizophrenia nor depression were at risk of suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996). However, with regard to experiencing deficit negative symptoms (concreteness and psychomotor retardation) at the 2-year follow-up, the study indicated that only individuals with depression were at risk for suicidal activity at the 7.5-year follow-up, compared to individuals with schizophrenia (Kaplan & Harrow, 1996). For instance, the study showed that 27% of depressed participants who experienced concreteness and psychomotor retardation symptoms at the 2-year follow-up were at risk of subsequent suicidal activity at the 7.5-year follow-up, compared to only 4% of depressed participants who did not exhibit concreteness or psychomotor retardation at the 2-year follow-up and had suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996). The difference between these two sub-groups was significant ($x^2 = 7.79$, $df = 1$, Fisher's exact $p < .02$; Kaplan & Harrow, 1996). However, when looking at individuals with schizophrenia, 26% who exhibited concreteness and psychomotor retardation symptoms at the 2-year follow-up had suicidal activity at the 7.5-year follow-up, compared to 19% who did not exhibit concreteness or psychomotor activity at the 2-year follow-up and had suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996). The difference between these two sub-groups was not significant ($x^2 = 0.35$, $df = 1$, Fisher's exact $p < .56$; Kaplan & Harrow, 1996).

In their second study, comprised of 71 patients with schizophrenia and 35 patients with schizoaffective disorder, Kaplan and Harrow (1999) explored the relationship between positive and negative symptoms, functioning upon discharge, and suicide. Of the participants, 64% were men and 36% were women (Kaplan & Harrow, 1999). Twenty-nine percent of study participants were African American and 71% were Caucasian (Kaplan & Harrow, 1999). About 72% of the

schizophrenia participants were medicated and 28% were unmedicated (Kaplan & Harrow, 1999).

At the 7.5-year follow-up, results indicated 8% of individuals with schizophrenia reported suicidal ideation, 12.6% had made suicidal attempts, and 1.4% completed suicide within the previous year (Kaplan & Harrow, 1999). At the 2-year follow-up, participants with schizophrenia who experienced hallucinations had a 12% chance of suicidal thoughts and a 24% chance of suicide attempts or completions at the 7.5- year follow-up ($x^2(1, N = 106) = 5.52, p < .05$; Kaplan & Harrow, 1999). Also, at the 2-year follow-up, participants with schizophrenia who experienced delusions had an 8% chance of suicidal thoughts and a 24% chance of suicide attempts or completions at the 7.5- year follow-up ($x^2(1, N = 106) = 3.83, p < .05$; Kaplan & Harrow, 1999).

The studies completed by Kaplan and Harrow (1996, 1999) both had limitations, which included being a part of a larger, longitudinal prospective study, the Chicago Follow-Up Study (Westermeyer & Harrow, 1989). Since the researchers recruited participants in the Chicago area, the results may not be generalizable to individuals with schizophrenia in other geographic areas (Kaplan & Harrow, 1996, 1999). Furthermore, because the researchers recruited participants from psychiatric hospitals, the results may not be generalizable to individuals with schizophrenia in an outpatient setting or those not in treatment (Kaplan & Harrow, 1996, 1999). In a prospective study, the design is for observational purposes only, so the study could not determine cause and effect (Kaplan & Harrow, 1996, 1999). Being part of a cohort study does not allow for random sampling, so there are members of the population with schizophrenia who may not be included in the study, making the sample non-representative of most individuals with schizophrenia (Kaplan & Harrow, 1996, 1999). Participants may have been subject to response

bias, which means they may have altered how they would normally respond to questionnaires or testing to respond in a manner they believed the researcher preferred them to respond (Kaplan & Harrow, 1996, 1999). For instance, if participants know they are part of a schizophrenia study, they may respond in a manner consistent with schizophrenia symptoms, which could alter the research results. There were significantly more male than female participants, so the study results may not be generalizable to most women with schizophrenia (Kaplan & Harrow, 1996, 1999). There were significantly more Caucasian participants than there were African-American participants, so results may not be representative of most African-Americans or other minorities with schizophrenia (Kaplan & Harrow, 1996, 1999). In summary, Kaplan and Harrow's studies (1996, 1999) found that experiencing some early positive symptoms, specifically hallucinations and delusions, was related to subsequent suicidal thoughts and behaviors, including attempts or completions in schizophrenia participants. Kaplan and Harrow (1996) were also able to demonstrate no predictive validity for any negative symptoms, positive symptoms, or thought disorders early in the course of the illness on subsequent suicidal thoughts or behaviors among individuals with schizophrenia.

Three studies indicated that positive symptoms are predictors of subsequent suicidal thoughts and behaviors (Bertelsen et al., 2007; Bornheimer, 2016; Bornheimer & Jaccard, 2017). In the first study, Bornheimer (2016) examined data from the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) study (Lieberman et al., 2005), which consisted of the records of 1,460 patients with schizophrenia. Participant gender was comprised of 26% women and 74% men (Bornheimer, 2016). Sixty percent of the study participants were White, 35% were Black, and 5% were other races (Bornheimer, 2016). This study not only looked at the relationship between depression, positive symptoms (hallucinations and delusions), and suicide,

but it also explored hopelessness as a potential risk factor for suicide among a population with schizophrenia (Bornheimer, 2016). The results of the Bornheimer (2016) study indicated that hallucinations (*product term b* = 0.84, *MOE* ± 0.12, *CR* = 10.65, $p < 0.001$) and delusions (*product term b* = 0.57, *MOE* ± 0.12, *CR* = 9.70, $p < 0.001$) could independently predict suicidal thoughts in participants. As hallucinations and delusions increased, depression and suicidal thoughts also increased, thus creating a moderating effect (*product term b* = 0.009, *MOE* ± 0.008, *CR* = 2.09, $p < 0.05$; Bornheimer, 2016).

In the second study of positive symptoms as predictors of subsequent suicidal thoughts and behaviors, Bornheimer and Jaccard (2017) also examined data from the CATIE study (Lieberman et al., 2005), using the same sample, to explore the relationship with depression, positive symptoms (hallucinations and delusions), and suicide. Study results indicated 76% of participants reported hallucinations and 85% reported delusions at baseline, 1.3% reported a history of attempts six months prior to entering the study, 28% reported experiencing suicidal thoughts after starting the study, and 17% of these participants reported suicidal thoughts only once after study initiation (Bornheimer & Jaccard, 2017). As each unit of positive symptoms (hallucinations and delusions) increased, suicidal ideation also increased by .02 units (or 2.4%; $p < 0.05$; Bornheimer & Jaccard, 2017).

The studies completed by Bornheimer (2016) and Bornheimer and Jaccard (2017) had similar limitations. The primary limitation included generalizability to individuals outside the sample of interest, individuals with schizophrenia who were seeking treatment and presented with positive symptoms and feelings of depression or hopelessness (Bornheimer, 2016; Bornheimer & Jaccard, 2017). Thus, individuals with schizophrenia without positive symptoms or those individuals not actively seeking help may not benefit from results of this study

(Bornheimer, 2016; Bornheimer & Jaccard, 2017). Another limitation may come from the nature of the studies (Bornheimer, 2016; Bornheimer & Jaccard, 2017), which sampled patients from only one source, the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) study (Lieberman et al., 2005). As such, the data may not reflect a comprehensive sample of patients. Additionally, as these researchers utilized data from one study, any bias and limitations within the CATIE study (Lieberman et al., 2005) could bias subsequent results (Bornheimer, 2016; Bornheimer & Jaccard, 2017).

The researchers recruited participants in both studies as part of a large dataset for a national U.S. study, so their respective results may not be generalizable to individuals with schizophrenia in other geographic areas or countries (Bornheimer, 2016; Bornheimer & Jaccard, 2017). Another limitation is that, even though participants in both studies were randomized, they also received psychotropic treatments, which could have influenced their respective study results, making them biased or invalid (Bornheimer, 2016; Bornheimer & Jaccard, 2017). Study participants in both studies may have been subject to response bias, which means they may have responded to follow-up questionnaires according to how they believed the researcher preferred them to respond versus responding in a more truthful manner (Bornheimer, 2016; Bornheimer & Jaccard, 2017). If participants knew they were part of a schizophrenia or mental health study, they may have responded in a manner consistent with schizophrenia or other mental health symptoms. Significantly more men than women participated in both studies, so their research results may not represent most women with schizophrenia (Bornheimer, 2016; Bornheimer & Jaccard, 2017). There were also significantly more White participants than minority participants in both studies, so their results may not accurately reflect those of most minority individuals with schizophrenia (Bornheimer, 2016; Bornheimer & Jaccard, 2017). Both studies indicated that, as

positive symptoms (hallucinations and delusions) increased, suicidal thoughts also increased (Bornheimer, 2016; Bornheimer & Jaccard, 2017). Additionally, Bornheimer (2016) was able to conclude that hallucinations and delusions could predict suicidal thoughts independently of one another. Further, Bornheimer (2016) found that when participants reported more hallucinations and delusions, depression and suicidal thoughts also increased among those participants, so positive symptoms were found to serve as a moderator.

In another study investigating positive symptoms as predictors of later suicide attempts, Bertelsen et al. (2007) conducted a longitudinal clinical trial of 547 inpatient and outpatient participants with schizophrenia spectrum disorder to compare treatment efficacy and follow-up over 2 years. The researchers recruited participants from clinics and psychiatric hospitals in a large metropolitan area in Denmark (Bertelsen et al., 2007). There were 224 female participants and 323 male participants (Bertelsen et al., 2007). The researchers randomized participants to one of two treatment arms (Bertelsen et al., 2007). The study showed positive symptoms significantly predicted a suicide plan and attempt at the 2-year follow-up (hallucinations – *OR* = 1.3 (95% CI: 1.12, 1.53; delusions – *OR* = 1.32 (95% CI: 1.05, 1.65; Bertelsen et al., 2007). Increases in hallucinations and delusions indicated that patients who had been in treatment for 1 year and were treatment-resistant were at higher risk for suicide 2 years later (Bertelsen et al., 2007).

The results of the study by Bertelsen et al. (2007) had a few limitations. First, the researchers based all data collected concerning suicidal ideation or attempts solely on interviews from participants and did not corroborate the data in other ways, which may bias data analysis (Bertelsen et al., 2007). Further, assessments of both suicidal ideation and behavior were not blind to researchers during treatment assignment, which could have biased results of the study

(Bertelsen et al., 2007). Also, the researchers recruited participants from treatment facilities in Copenhagen, Denmark, so study results may not be generalizable to untreated suicidal individuals with schizophrenia in other geographic or rural areas (Bertelsen et al., 2007). There were more male than female participants, so the study results may not be generalizable to most female individuals with schizophrenia (Bertelsen et al., 2007). Finally, the longitudinal nature of the study may subject its participants to cohort effects, which could alter the results, as longitudinal studies may lead researchers to anticipate results, creating inadvertent bias (Bertelsen et al., 2007). Regardless of each study's limitations, two of the three aforementioned studies (Bornheimer, 2016; Bertelsen et al., 2007) found evidence that hallucinations and delusions not only influenced suicidal thoughts and behaviors, but their findings predicted them, which will be critical in clinical interventions and future research studies.

Two studies examined records of patients with schizophrenia who completed or died by suicide to retroactively determine suicide risk factors (Heilä et al., 1999; Saarinen et al., 1999). In the first study, Heilä et al. (1999), looked at 88 autopsy reports of individuals with schizophrenia who died by suicide and were in either the active or residual phases of the disorder. The researchers recruited participants in both studies from a large suicide prevention project in Finland ($N = 1397$), using a psychological autopsy format (Heilä et al., 1999). Since participants were deceased, the Heilä et al. (1999) study utilized collateral data, such as interviews with family members and health care professionals, medical records, police reports, and toxicology reports. About 25% of study participants were in an inpatient setting at the time of their suicide, while the remaining 75% of study participants were in an outpatient setting at the time of their suicide completion (Heilä et al., 1999). According to the DSM-III-R, the active phase of schizophrenia is the most acute or symptomatic phase, which includes delusions and

hallucinations (APA, 1987). The residual phase of schizophrenia is a less severe and symptomatic phase (APA, 1987).

Study results indicated that 74% of participants completed suicide during the active phase, 21% completed suicide during the residual phase, and the phase was undetermined for the remaining 5% of participants (Heilä et al., 1999). About 60% percent of study participants experienced both positive and depressive symptoms (Heilä et al., 1999). Even though the other subtypes were diagnosed, the study only reported the paranoid subtype (Heilä et al., 1999). Thirty-four percent of all study participants were diagnosed with the paranoid subtype, which means paranoid delusions were primary compared to other schizophrenia symptoms (Heilä et al., 1999). Research suggests individuals who have been in a psychiatric facility are at the highest risk for suicide during the first three months following their discharge (Haglund et al., 2019). The Heilä et al. (1999) study found participants with schizophrenia who died by suicide during the three-month period following their discharges (n = 28) to have the following characteristics: comorbid alcohol abuse or dependence (36%), paranoid subtype (57%), positive symptoms (83%), active phase of illness (96%), depressive symptoms (62%), more suicide attempts in the last year (59%), and more suicidal thoughts and behaviors in the last three months of life (74%).

The second study by Saarinen et al. (1999) looked at the charts of 17 patients with schizophrenia who died by suicide to retroactively identify possible suicide risk factors. The researchers collected participants from a larger suicide prevention program in Finland, which consisted of 108 individuals who died by suicide (17 had schizophrenia, 63 had depression, and 21 had alcohol dependence; Saarinen et al., 1999). Of the 17 participants with schizophrenia, 9 were female (53%) and 8 were male (41%; Saarinen et al., 1999). All participants, except one male individual with schizophrenia, received treatment at the time of their deaths (Saarinen et al.,

1999). Thirty-five percent of individuals with schizophrenia (n = 6) exhibited more paranoid symptoms and 59% of individuals with schizophrenia (n = 10) exhibited more depressed symptoms at the time of their deaths (Saarinen et al., 1999). The study design was a psychological autopsy with collateral data, including interviews with health care professionals and close relatives and medical records (Saarinen et al., 1999). The most common method of suicide was via overdose (47%), which was also more common among female individuals with schizophrenia (88.9%; Saarinen et al., 1999).

Since the Saarinen et al. (1999) and Heilä et al. (1999) studies obtained samples from the same large national suicide prevention project, there were some shared limitations. First, since the researchers recruited study participants as part of the same larger study, participants could have been subject to selection bias and skew subsequent results as participants may not adequately represent most individuals with schizophrenia (Heilä et al., 1999; Saarinen et al., 1999). Also, there were problems with generalizability outside of those individuals within the sample, which included patients who lived in Finland and who had received treatment, had been diagnosed with schizophrenia, and had completed suicide attempts (Heilä et al., 1999; Saarinen et al., 1999). The fact that most participants in each study had received pharmacological treatments could have altered the study results (Heilä et al., 1999; Saarinen et al., 1999). The number of alternate factors that could have increased suicide risk in participants aside from positive symptoms, such as comorbid alcoholism or depression, could be confounding variables (Heilä et al., 1999; Saarinen et al., 1999). The researchers chose to utilize psychological autopsies that relied on collateral data, such as interviews with mental health professionals and close friends or family members (Heilä et al., 1999; Saarinen et al., 1999). This study design could contain inaccurate or contradicting information related to events that may have contributed

to the participants' suicide deaths, biasing the results (Heilä et al., 1999; Saarinen et al., 1999). Further, due to the age of these studies, they utilized previous versions of diagnostic criteria (e.g. DSM-III-R; APA, 1987) that have since changed. For example, the DSM-5 no longer uses schizophrenia subtypes, as they were determined to be of limited reliability (APA, 2013).

A limitation exclusively for the Heilä et al. (1999) study included the fact that researchers chose to focus on participants in various phases of their illness, meaning symptoms were more severe in some than in others, so the results may not be generalizable to most individuals with schizophrenia. A respective limitation for the Saarinen et al. (1999) study is the extremely small sample size (n = 17), which reduces the validity of the study's results as well as its statistical power. Another limitation for the Saarinen et al. (1999) study is that researchers pressed close family members to recall information related to the deceased participant for several hours, regardless of how traumatic it was for them, which could have altered their responses and invalidated the results. Regardless of the limitations, both studies were able to suggest a link between positive symptoms, such as paranoid delusions or hallucinations, and suicide deaths among a few individuals with schizophrenia (Heilä et al., 1999; Saarinen et al., 1999).

Taken together, the results of all 11 studies (Baca-Garcia et al., 2005; Bertelsen et al., 2007; Bornheimer, 2016; Bornheimer & Jaccard, 2017; Fox et al., 2004; Heilä et al., 1999; Kaplan & Harrow, 1996, 1999; Saarinen et al., 1999; Simms et al., 2007; Yan et al., 2013) suggest a link between positive symptoms, specifically hallucinations, including negative-content auditory or command hallucinations, and delusions present in patients with schizophrenia and increased risk of completed suicide, suicide attempts, or suicidal ideation. Some studies identified that experiencing positive symptoms early in the course of schizophrenia can predict subsequent suicide (Bertelsen et al., 2007; Bornheimer, 2016; Bornheimer & Jaccard, 2017),

while the mitigation of positive symptoms may delay or reduce suicidal thoughts or actions. However, most of these studies contained major limitations, such as small sample sizes (Baca-Garcia et al., 2005; Fox et al., 2004; Saarinen et al., 1999; Simms et al., 2007); study designs that only explored correlations instead of causality, such as cross-sectional (Simms et al., 2007), psychological autopsy (Heilä et al., 1999; Saarinen et al., 1999), or longitudinal (Bertelsen et al., 2007; Kaplan & Harrow, 1996, 1999); retroactive chart reviews (Heilä et al., 1999; Saarinen et al., 1999); lack of a comparison group (Bornheimer, 2016; Bornheimer & Jaccard, 2017); confounding factors, such as comorbid disorders (Baca-Garcia et al., 2005; Simms et al., 2007) or psychotropic medications (Bertelsen et al., 2007; Bornheimer, 2016; Bornheimer & Jaccard, 2017; Kaplan & Harrow, 1996, 1999; Yan et al., 2013); and poor generalizability of results (Baca-Garcia et al., 2005; Fox et al., 2004; Simms et al., 2007). The results in the aforementioned studies (Baca-Garcia et al., 2005; Bertelsen et al., 2007; Bornheimer, 2016; Bornheimer & Jaccard, 2017; Fox et al., 2004; Heilä et al., 1999; Kaplan & Harrow, 1996, 1999; Saarinen et al., 1999; Simms et al., 2007; Yan et al., 2013), regardless of how minimal in some cases, indicate an association between certain positive symptoms and suicide, which warrants further exploration.

Of importance is that both positive symptoms and suicide present differently between genders, races, and ethnicities and among individuals with a higher premorbid IQ in the population with schizophrenia. Although the research on both suicide and schizophrenia is vast, it is sparse as it relates to the role positive symptoms play when they interact with these crucial variables. Differentiating how gender, race and ethnicity, and IQ interact with positive symptoms is essential in reducing the mortality rates and improving long-term functioning among these populations. Furthermore, it is of importance to understand how these variables interact to help

clinicians identify the best treatment interventions. Prevention measures and treatment options will vary due to the different presentations and courses of illness among suicidal individuals with schizophrenia, so it is imperative to explore gender, race/ethnicity, and premorbid IQ variables and their relationships to positive symptoms and suicide.

Purpose of the Literature Review

The purpose of this literature review is two-fold: (a) to examine and identify the role of positive symptoms among suicidal individuals with schizophrenia while looking at gender, race/ethnicity, and premorbid intelligence quotient (IQ) variables; and (b) to synthesize this diverse literature in a way that provides hypotheses for future research. A systematic review and analysis of the available empirical literature will be performed. While much research has been conducted on variables related to suicide among individuals with schizophrenia, there is limited information regarding how positive symptoms, specifically hallucinations and delusions, relate to suicide risk among the population with schizophrenia according to gender, race/ethnicity, and premorbid IQ. Early identification of how contributing factors such as positive symptoms impact suicide risk among this population could aid mental health providers (and future researchers) in developing assessment and treatment tools to reduce mortality rates and other associated negative social, financial, and educational consequences.

Methods

Organizing Principles

The paper was organized into five major sections, each examining the risk factors associated with suicidal actions or thoughts within individuals with schizophrenia. The Introduction addresses the importance and relevance of the topic along with the purpose of the literature review and methods, which include definitions, nosology, diagnostic history, databases

searched, and inclusion/exclusion principles. The three subsequent chapters explore the association between positive symptoms and suicide among individuals with schizophrenia according to gender, race/ethnicity, and premorbid IQ variables. The last chapter is devoted to a summary of research findings, clinical implications, and recommendations for further research.

Databases Searched

A systematic search and review of the literature was conducted within the following computerized article databases: PsychINFO, ProQUEST, EBSCO, and Medline. The use of multiple databases served to increase the chance of identifying all possible studies that fell within the scope of the review. The search for publications was conducted using the following keywords: *schizophreni*, suicid*, positive symptom, active phase symptom, psychotic, psychosis, hallucination, delusion, gender, male, female, men, women, man, woman, race, Caucasian, White, African-American, African, Black, Asian, Asian-American, ethnicity, premorbid intelligence quotient, premorbid IQ, IQ, intelligence,* and various other synonyms for the presented searched terms. The reference sections of articles were also reviewed to identify any additional relevant studies. Each of the publications was coded for inclusion or exclusion based on the categories discussed below.

Inclusion/Exclusion Principles

The search efforts yielded over 700 articles addressing aspects of risk factors associated with positive symptoms, suicide, and schizophrenia. To identify articles most relevant to the topic, the following requirements were applied for inclusion criteria in the literature search: (1) the study was empirical and published in a peer-reviewed professional journal; (2) the study was published in English; (3) results for individuals with a diagnosis of schizoaffective, schizophreniform, schizotypal disorders, and late or childhood onset schizophrenia were not

included in the current review; (4) results for participants diagnosed with schizophrenia had to be listed separately from other psychiatric disorders; (5) the study participants had to be at least 16 years of age; (6) risk factors were key concepts of the study; (7) gender variables had to be related to suicide among adults, schizophrenia among adults, and suicidal adults with schizophrenia as related to positive symptoms; (8) race and ethnicity variables had to be related to suicide among adults, schizophrenia among adults, and suicidal adults with schizophrenia as related to positive symptoms; and (9) the premorbid IQ variable had to be related to suicide among adults, schizophrenia among adults, and suicidal adults with schizophrenia as related to positive symptoms. Using the above-referenced criteria, the search identified peer-reviewed, empirical studies in the English language eligible for review. These studies were systematically reviewed, and detailed summaries of all articles were provided.

Research Questions

Research Question 1: How does gender impact the relationship between positive symptoms and suicide in individuals with schizophrenia? Known gender differences in suicidal behaviors and reported rates and estimated gender differences in onset and course of schizophrenia warrant further exploration of potential gender differences in positive symptoms and suicide among individuals with schizophrenia.

Research Question 2: How does race or ethnicity impact the relationship between positive symptoms and suicide in individuals with schizophrenia? In light of known racial and ethnic group differences in reported suicide and schizophrenia rates as well as cultural mental health disparities, exploring potential race and ethnicity differences in positive symptoms among suicidal individuals with schizophrenia is indicated.

Research Question 3: How does premorbid intelligence quotient (IQ) impact the relationship between positive symptoms and suicide in individuals with schizophrenia? Known differences in premorbid IQ and cognitive functioning among suicidal individuals as well as those with a schizophrenia diagnosis warrants a closer examination of the potential relationship between positive symptoms, premorbid IQ, and suicide among individuals with schizophrenia.

CHAPTER II: THE IMPACT OF GENDER ON SUICIDE RISK IN INDIVIDUALS WITH SCHIZOPHRENIA

Men and women with schizophrenia tend to have different suicide rates, timeframes for onset of the disorder, symptom presentations, and prognosis. Men with schizophrenia are more likely to complete suicide, while women with schizophrenia have been found to attempt suicide more often (CDC, 2019). Men with schizophrenia experience symptoms and receive a diagnosis at an earlier age and have a poorer prognosis than women with schizophrenia (APA, 2013). Sociodemographic (Atalay & Atalay, 2006) and biological factors (De Luca et al., 2010) can explain some of these gender differences. Due to known gender differences among individuals with schizophrenia, being able to better understand differences in course and symptom presentation in order to tailor treatment accordingly is indicated, especially due to high suicide risk among people with schizophrenia as compared to the general population (Drapeau & McIntosh, 2017).

Gender Differences among Individuals with Schizophrenia

Sociodemographic-Related Gender Differences

The literature on sociodemographic gender differences among individuals with schizophrenia is limited. A study by Atalay and Atalay (2006) explored sociodemographic and clinical differences among 40 men and 40 women with schizophrenia in an acute psychosis unit of a Turkish psychiatric hospital. Results indicated that 30% of the female and 12.5% of the male participants were married and that 25% of female but only 2.5% of male participants lived with their spouse and children (Atalay & Atalay, 2006). Five percent of the men and 10% of the women lived alone (Atalay & Atalay, 2006). Sixty-five percent of male and 52.5% of female participants lived with both parents, while 25% of male and 10% of female participants lived

with only one parent (Atalay & Atalay, 2006). Female participants with schizophrenia in this sample had higher rates of social functioning, such as being married, being employed, being more educated, having children, living independently versus living with others, and having higher global assessment of functioning (GAF) scores. Female participants exhibited higher rates of employment (97.5%) compared to 85% of employed men (Atalay & Atalay, 2006). However, the differences in unemployment rates became non-significant when female participants reported their jobs as housewives (50%; Atalay & Atalay, 2006). Both genders had low rates of educational attainment; for 50% of females and 57.5% of males, the highest level of education was 0 to 5 years of school (Atalay & Atalay, 2006). However, 25% of female and 20% of male participants had 12 to 14 years of education, indicating that more women had at least a high school education compared to men (Atalay & Atalay, 2006). The mean age of onset of schizophrenia was 24.67 years for women and 21.6 years for men, showing that women in this sample had a later onset of schizophrenia than men (Atalay & Atalay, 2006).

The mean age of the first hospitalization for women was 28.77 and 22.92 for men, showing that women were admitted to hospitals at an older age than men, which could be attributed to a later onset of the illness in women (Atalay & Atalay, 2006). The researchers ascertained each participant's age of first hospitalization through interviews with the patients as well as interviews with the patients' family members to confirm details (Atalay & Atalay, 2006). The mean number of inpatient admissions was 4.72 for women and 7.62 for men, demonstrating that the men had more hospitalizations (Atalay & Atalay, 2006). The mean number of days for inpatient stays for women was 105.3, versus 185 days for men, so men had more extended hospital stays and were more frequently hospitalized (Atalay & Atalay, 2006). Women had higher rates of previous suicide attempts (27.5%) compared to men (10%; Atalay & Atalay,

2006). There was a significant difference in positive symptom scores for men and women on the Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984). On the positive thought disorder subscale, men reported higher rates of a positive thought disorder (M = 2.85) than women (M = 2.12, p = 0.02), which the authors attributed to a greater number of paranoid symptoms for women (Atalay & Atalay, 2006). More women were diagnosed with the paranoid subtype (52.5%) compared to men (35%; Atalay & Atalay, 2006), and slightly more women were diagnosed with the undifferentiated subtype (37.5%) compared to men (32.5%; Atalay & Atalay, 2006). However, more men were diagnosed with the disorganized subtype (32.5%) compared to women (10%; Atalay & Atalay, 2006).

There were a few limitations to the research completed by Atalay and Atalay (2006). First, results may not be generalizable outside of the population in the study, which included individuals with schizophrenia in Turkey who received treatment in an acute psychosis unit of a psychiatric facility (Atalay & Atalay, 2006). The study did consider demographics such as marital status, education, and employment, but it did not explore individual schizophrenia symptoms and demographics together to determine a potential relationship to suicide (Atalay & Atalay, 2006). The study used SAPS (Andreasen, 1984) scores to assess gender differences but did not compare them to suicide (Atalay & Atalay, 2006). The study also assessed the frequency of individual positive and negative symptoms between genders but, again, did not compare them to suicide (Atalay & Atalay, 2006). Since this study used DSM-IV (APA, 1994) criteria, the schizophrenia subtypes and global assessment of function (GAF) scores were also used (Atalay & Atalay, 2006). Women exhibited more paranoid symptoms, which are delusions, a type of positive symptom (Atalay & Atalay, 2006). The DSM-5 (APA, 2013) eliminated subtypes, so other than the absence of a subtype, schizophrenia criteria would not change today (Atalay &

Atalay, 2006). However, the DSM-5 (APA, 2013) also eliminated GAF scores, which could reduce the validity of results in the Atalay and Atalay (2006) study related to social functioning. The same researcher conducted interviews with all patients in the study, so there was not a comparison for diagnostic accuracy (Atalay & Atalay, 2006). Because only one person diagnosed participants, the study did not have high inter-rater reliability, so the study could have inappropriately included or excluded participants based on schizophrenia diagnosis (Atalay & Atalay, 2006).

A strength of the Atalay and Atalay (2006) was its large sample size (N = 80) and an equal of number of male and female participants, which allowed for a more accurate comparison of gender differences. The fact that the researchers disclosed detailed information on the study to participants and obtained informed consent was important, especially since they used human participants (Atalay & Atalay, 2006). Also, being able to assess living participants allowed the researchers to gain a more accurate and thorough understanding of schizophrenia symptoms and reasons for suicide (Atalay & Atalay, 2006). The study was able to minimize external confounds by excluding individuals with intellectual disabilities and histories of alcohol or substance abuse (Atalay & Atalay, 2006). Conducting in-person clinical interviews, having psychiatrists administer assessments, performing medical record reviews, and obtaining collateral data from family members demonstrated the researchers did a thorough job of gathering data from multiple sources, which bolstered their findings (Atalay & Atalay, 2006). Not using self-report measures was a strength, since participants are more likely to not respond honestly with these types of assessments (Atalay & Atalay, 2006). Also, self-reports are not appropriate for individuals with severe mental illness, such as schizophrenia, because they may misinterpret the questions (Atalay & Atalay, 2006). Both positive symptoms and suicide attempts were assessed in the study,

though the two variables were not explored together to further assess gender differences (Atalay & Atalay, 2006). Psychometrically reliable and valid assessment measures, such as the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1989), the SAPS (Andreasen, 1984), and the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962), ensured the research results would be more generalizable and replicable in future studies (Atalay & Atalay, 2006).

Atalay and Atalay (2006) determined that women tend to have more time to complete their education, establish relationships, and start their careers before schizophrenia symptoms begin to interfere, as compared to men with schizophrenia, who are less likely to accomplish these life goals or events due to an earlier onset of schizophrenia. Atalay and Atalay (2006) were also able to conclude that, although males with schizophrenia in Turkey have higher rates of completed suicide, there exist sociodemographic factors specific to an individual's gender that may contribute to increased prevalence of suicide attempts within female cohorts.

Another study by Usall et al. (2001) looked at clinical and social attributes among a population of individuals with schizophrenia (N = 239) to determine gender differences. There were 153 men and 86 women (Usall et al., 2001). The researchers recruited participants from five outpatient facilities in Barcelona, Spain who received treatment over a six-month period (Usall et al., 2001). Study results indicated female participants were significantly older than male participants (44 years versus 36 years, $p < .001$), and considerably more men with schizophrenia were single compared to women (82% versus 41%, $p < .001$; Usall et al., 2001). Regarding employment, more men with schizophrenia were unemployed compared to women (79.1% versus 61.6%, $p < .005$; Usall et al., 2001). Men with schizophrenia had a younger age of onset of schizophrenia compared to women (mean age of 23 versus 26, $p < .05$), but the course of schizophrenia in women tended to be longer compared to men (20 versus 15 years, $p < .001$;

Usall et al., 2001). Men tended to score lower on the GAF scale compared to women (42.4 versus 45.6), but the differences were not statistically significant (Usall et al., 2001). Men with schizophrenia also reported higher levels of total disability (11.4 compared to 10.1) according to mean scores on the World Health Organization (WHO) Disability Assessment Scale (DAS; WHO, 1988), but again the differences were not statistically significant (Usall et al., 2001). There were no gender differences in total positive symptoms; however, men scored higher on the PANSS (Kay et al., 1987) grandiosity subscale ($p < .05$; Usall et al., 2001). Women were also more often diagnosed with the paranoid subtype of schizophrenia (53.5% versus 47.7%) compared to men using the DSM-IV (APA, 1987), but the differences were not statistically significant (Usall et al., 2001).

There were a few limitations in the Usall et al. (2001) study. First, even though the sample size was adequate (N = 239), there were almost twice as many men (n = 153) as there were women (n = 86) participants, so the sample may not adequately represent the overall population of men and women with schizophrenia (Usall et al., 2001). Also, the study only included participants who were receiving treatment (Usall et al., 2001). Participants were from outpatient clinics in Barcelona, so results are not generalizable to participants with schizophrenia in inpatient settings, untreated individuals with schizophrenia, or individuals in other geographic areas (Usall et al., 2001). Finally, this study did not consider suicide (Usall et al., 2001).

A strength of the Usall et al. (2001) study was its large sample size, which increased external validity and made the results more applicable to most individuals with schizophrenia in an outpatient setting. A larger sample size also reduced the margin of error and increased the accuracy of the study results (Usall et al., 2001). The researchers used systematic sampling to randomly select participants, which helped to equalize the opportunity for each participant to be

included in the study (Usall et al., 2001). The study design was cross-sectional, so the researchers were able to collect data at a specific point in time, which helped reduce attrition and increase the validity of the results (Usall et al., 2001). In using the cross-sectional design, the researchers were able explore multiple variables, which made the results more generalizable to most individuals with schizophrenia (Usall et al., 2001). The Usall et al. (2001) study equalized occupation between genders by using the category of housewife. The study was able to control for external factors, such as alcohol or substance abuse, intellectual disability, neurological disorders, or head trauma, by excluding participants with such histories (Usall et al., 2001). The researchers obtained informed consent from participants and explained the study to both participants and their family members, which ensured the researchers' transparency and fidelity and increased the participants' autonomy (Usall et al., 2001). The researchers used the DSM-IV (APA, 2013) to diagnose participants, so the criteria for schizophrenia and global functioning was standardized (Usall et al., 2001). The researchers also used standardized assessment tools, such as the PANSS (Kay et al., 1987), the DAS (WHO, 1988) and the Client Services Receipt Inventory, which ensured the data collected were objective and relatively free from researcher bias and the test results were valid (Usall et al., 2001). Using the Spanish version of the PANSS (Kay et al., 1987) helped to equalize participants included in the study who were culturally diverse and provided the researchers with more information on individuals with schizophrenia in diverse populations, making the results more relevant and generalizable to most individuals with schizophrenia (Usall et al., 2001). Multiple trained psychiatrists completed the clinical interviews and psychological testing, which increased inter-rater reliability and accuracy of assessment scores (Usall et al., 2001). In summary, Usall et al. (2001) were able to identify

sociodemographic gender differences related to overall functioning, disability, and symptomatology among individuals with schizophrenia.

A cross-sectional study in an outpatient facility in Brazil by Chaves et al. (1993) examined 83 participants with schizophrenia (37 women and 46 men) to determine gender differences in social functioning. Results concluded that the mean age of onset for a schizophrenia diagnosis among male participants was younger compared to female participants (19.80 versus 23.44 years; Chaves et al., 1993). The mean age of first mental health hospitalization was younger in men with schizophrenia compared to women with schizophrenia (21.10 versus 24.80 years; Chaves et al., 1993). Significantly more men were single and never married compared to women (91.3% versus 67.6%; Chaves et al., 1993). Female participants performed better at self-care, a subscale of the DAS (WHO, 1988) that assesses difficulties with bathing, dressing, eating, and staying by oneself for multiple days, with a mean score of 0.27 compared to male participants who had a mean score of 0.82 (Chaves et al., 1993). Male participants exhibited more disability, or difficulty completing various tasks as assessed on each subscale of the DAS (WHO, 1988), as evidenced by a higher mean score 1.54 compared to 0.93 for female participants (Chaves et al., 1993). There was a statistically significant interaction between gender and positive symptoms total, meaning the higher the positive symptoms score, the poorer the social role performance, which was only found in female participants with schizophrenia (Chaves et al., 1993). The positive or negative symptom scores on the PANSS (Kay et al., 1987) indicated no gender differences (Chaves et al., 1993).

Limitations in the Chaves et al. (1993) study included that there were more male than female participants, which made it difficult to adequately understand differences between genders. Next, the researchers recruited participants from outpatient facilities in Brazil, so results

may not be generalizable to untreated or inpatient individuals with schizophrenia in other geographic areas (Chaves et al., 1993). This study did not explore individual positive symptoms or suicide (Chaves et al., 1993).

A strength of the Chaves et al. (1993) study was its adequate sample size (N = 83), which provided more accurate study results, increased the ability to statistically detect group differences, and increased the generalizability of the results to more individuals with schizophrenia. The study included a small, random sample of outpatient participants from one of the cities (n = 10), which helped to increase the applicability of the study's findings to more individuals with schizophrenia in that area (Chaves et al., 1993). The researchers used the DSM-III-R (APA, 1987) criteria for schizophrenia to standardize psychiatric diagnoses of participants. Another strength was researchers used the Brazilian version of the PANSS (Kay et al., 1987), which allowed them to overcome the confounding variable of a language barrier by using a translated assessment tool (Chaves et al., 1993). Using a translated assessment tool also provided more information about Brazilian individuals with schizophrenia, which increased generalizability of the findings to other diverse populations (Chaves et al., 1993). The researchers also employed other standardized psychological assessment measures, such as the PANSS (Kay et al. 1987) and DAS (WHO, 1988), which increased validity of test results (Chaves et al., 1993). Two trained psychologists conducted the clinical interviews, versus only one, which increased the inter-rater reliability as well as the quality of test data (Chaves et al., 1993). The fact that the researchers did not give self-report measures to participants reduced the chances of participants providing false or misinterpreted responses, which could occur with individuals with a severe mental illness, such as schizophrenia (Chaves et al., 1993). The cross-sectional study design provided a snapshot of data and was able to include multiple variables,

which broadened the applicability of the results to more individuals with schizophrenia in real-life situations (Chaves et al., 1993). A cross-sectional design also minimized the loss of participants, which increased statistical power, the ability to detect group differences, and the validity of the study results (Chaves et al., 1993). In summary, Chaves et al. (1993) were able to determine gender differences related to gender roles and positive symptoms, functioning and disability, and age of onset of the disorder.

A final study on this topic was by Shtasel et al. (1992), who studied 107 participants with schizophrenia (33 women and 74 men) in order to explore gender differences related to symptomatology in treatment-naïve individuals. The researchers recruited participants from a university research facility that studied schizophrenia in the U.S. (Shtasel et al., 1992). The study included those who met criteria for DSM-III-R (APA, 1987) for schizophrenia or schizophreniform at baseline and at the six-month follow-up (Shtasel et al., 1992).

Results revealed that the male participants had more severe negative symptom scores (2.75 ± 1.06) compared to female participants (2.27 ± 0.97; $t(105) = 2.21$, $p<0.025$, 1-tailed; Shtasel et al., 1992). Female participants did not have more severe positive symptoms as originally hypothesized (2.45 ± 0.75) compared to male participants (2.59 ± 0.83, $t < 1$; Shtasel et al., 1992). Male participants exhibited worse quality of life (1.95 ± 1.17) as compared to female participants (2.58 ± 1.25; Shtasel et al., 1992). Female participants performed better on social functioning ($t=3.03$, $p=0.005$, and $t = 1.90$, $p=0.05$) compared to male participants (Shtasel et al., 1992).

The Shtasel et al. (1992) study had several limitations. First, the researchers recruited participants from assessment and schizophrenia research centers, so they were subject to sample bias, since the researchers did not select them randomly, which decreased the generalizability of

the study results (Shtasel et al., 1992). Additionally, there were more than twice as many men as women in the study, so gender-specific results may not be accurate (Shtasel et al., 1992). Furthermore, the study did not assess suicide (Shtasel et al., 1992). Since participants were taken off psychotropic medications before enrolling in the study, their symptoms may have been more severe as compared to someone on medications, which could inflate the assessment results (Shtasel et al., 1992).

A strength of the Shtasel et al. (1992) study was its adequate sample size (N = 107), so the results were generalizable to more individuals with schizophrenia, which also increased the ability to detect gender differences. Participants without medication reduced the potential confounding variable of a treatment intervention interfering with symptomatology and assessment results (Shtasel et al., 1992). The fact that a psychiatrist diagnosed and evaluated the study participants and trained research team personnel conducted psychological testing increased the quality of participants included in the study as well as the validity of test results (Shtasel et al., 1992). Exclusion criteria, such as no other Axis I disorder, substance abuse or dependence history, neurological disorders, head injuries, or any medical conditions which could alter brain functioning, helped the researchers to reduce interference from external confounding variables (Shtasel et al., 1992). The researchers used the DSM-III-R (APA, 1987) to diagnose participants at the beginning of the study and six months later, which improved and standardized accuracy of the diagnosis among participants (Shtasel et al., 1992). The researchers also used standardized psychological assessment measures, such as the Structured Clinical Interview for DSM-III-R (SCID; Spitzer et al., 1992), the BPRS (Overall & Gorham, 1962), the SANS (Andreasen, 1989), the SAPS (Andreasen, 1984), the Hamilton Scale for Depression (HAMD; Hamilton, 1960), the Premorbid Adjustment Scale (PMA; Harris, 1975), and the Quality of Life Scale (QOL;

Heinrichs et al., 1984), which increased validity of test results (Shtasel et al., 1992). Inter-rater reliability for the BPRS (Overall & Gorham, 1962) was 0.83, for the SANS (Andreasen, 1989) it was 0.98 (for individual item and global rating averages), and for the SAPS (Andreasen, 1984) it was 0.90 and 0.96, all of which are high (Shtasel et al., 1992). In summary, Shtasel et al. (1992) were able to determine gender differences related to schizophrenia symptoms, quality of life, and functioning among individuals with schizophrenia.

In summary, the literature on sociodemographic gender differences among individuals with schizophrenia remains consistent. Women with schizophrenia are more often married (Atalay & Atalay, 2006), older at onset of the disease (Atalay & Atalay, 2006), have better social and overall functioning (Atalay & Atalay, 2006; Chaves et al., 1993; Shtasel et al., 1992; Usall et al., 2001), and are more often diagnosed with the paranoid subtype of schizophrenia (Atalay & Atalay, 2006; Usall et al., 2001), compared to males. By contrast, men with schizophrenia are more often single or never married, diagnosed with schizophrenia at a younger age (Atalay & Atalay, 2006; Chaves et al., 1993; Usall et al., 2001) have more disability (Shtasel et al., 1992; Usall et al., 2001), and have more inpatient hospitalizations (Atalay & Atalay, 2006). However, the literature is more divided as it relates to more specific factors; for instance, women with schizophrenia who exhibited more positive symptoms were found to have lower performance in their social roles (Chaves et al., 1993). Men with schizophrenia were found to experience more negative and positive symptoms (Shtasel et al., 1992), but the gender difference was not statistically significant for positive symptoms. Men had higher scores than women on the PANSS (Kay et al., 1987) grandiosity subscale in the study by Usall et al. (2001) and on the SAPS (Andreasen, 1984) positive thought disorder subscale in the work by Atalay and Atalay (2006). Usall et al. (2001) found no gender differences in total positive symptoms, and Chaves et

al. (1993) found no differences in gender regarding positive or negative symptoms. Similar to the general population, Atalay and Atalay (2006) found women with schizophrenia to have more suicide attempts compared to men.

Biological-Related Risk Factors

In addition to sociodemographic factors, schizophrenia etiology consists of an array of biological-related factors. Similar to socio-demographic factors, much of the extant literature on biological-related risk factor studies focuses on either schizophrenia (Brown, 2006; Kiliçaslan et al., 2014; Kulkarni et al., 2015) or suicide (Freeman et al., 2017) rather than suicidal individuals with schizophrenia, as biological factors may be hard to isolate outside confounding variables.

A study completed by Ray et al. (2019) examined the change in symptoms that present with schizophrenia during menses. To accomplish this goal, Ray et al., (2019) investigated symptom presentation in 40 female inpatients of a tertiary care psychiatric hospital in India as part of a prospective study. All participants were given antipsychotic medications (Ray et al., 2019). The researchers examined participants for 15 months and up to two menstrual cycles by applying the PANSS (Kay et al., 1987; Ray et al., 2019). The premenstrual part of the cycle was defined as seven days before the first menstruation cycle or the first progesterone phase (Ray et al., 2019). The postmenstrual part of the cycle was defined as seven days after the first menstrual cycle or the first estrogen phase (Ray et al., 2019). For the second menstruation cycle, the seven days before were referred to as the second progesterone phase, and seven days after were called the second estrogen phase (Ray et al., 2019).

When the researchers tallied and compared the results of the PANSS (Kay et al., 1987) using paired t-tests, they found no statistically significant decrease in total PANSS (Kay et al., 1987) scores from premenstrual to menstrual periods in the first progesterone stage ($p=0.400$;

Ray et al., 2019). There were statistically significant decreases in total PANSS (Kay et al., 1987) scores from premenstrual to menstrual in the second progesterone stage (p=0.002) as well as from menstrual to postmenstrual in the first (p=0.000) and second (p=0.002) estrogen stages (Ray et al., 2019).

When Ray et al. (2019) examined the expression of total positive symptoms, there were statistically significant decreases in scores from premenstrual to menstrual in the first (p=0.000) and second (p=0.013) progesterone stages. However, from menstrual to postmenstrual in the first and second estrogen stages, there were no statistically significant differences in total positive symptom scores. Ray et al. (2019) observed statistically significant decreases in individual positive symptom scores, excitement (p=0.002) and hostility (p=0.000), from premenstrual to menstrual phases of the first cycle. The study only noted that hostility (p=0.044) reached statistical significance from premenstrual to menstrual phases in the second cycle (Ray et al., 2019). Improvements in total positive symptoms and individual positive symptoms (excitement and hostility) occurred seven days prior to the menstrual cycles starting, which is known as the progesterone stage (Ray et al., 2019). No improvements in total positive symptoms occurred seven days after the menstrual cycles started, which is known as the estrogen stage (Ray et al., 2019).

When Ray et al. (2019) examined total negative symptoms from premenstrual to menstrual in the first and second progesterone stages, there were no statistically significant differences in the PANSS (Kay et al., 1987) sub-scale scores. However, when Ray et al. (2019) looked at total negative symptoms from menstrual to postmenstrual, there were statistically significant decreases from the first (p = 0.000) and second (p = 0.016) estrogen stages. Symptoms of anxiety were highly reduced (p = 0.006) as was tension (p = 0.006; Ray et al.,

2019). Depressive symptoms were also reduced ($p = 0.000$; Ray et al., 2019). Additionally, symptoms of pre-occupation ($p = 0.000$) and any symptoms of active social avoidance were also reduced ($p = 0.000$; Ray et al., 2019).

Ray et al. (2019) also noticed significant reduction in positive symptoms associated with unusual thought content in patients ($p = 0.018$), volitional disturbance ($p = 0.031$), and poor impulse control ($p = 0.037$), which are all commonly associated with schizophrenia. A decrease in negative and positive symptoms during various stages of menstruation suggests a relationship between hormone levels and schizophrenia symptoms, especially since the levels of hormones (progesterone and estrogen) tend to fluctuate throughout the menstrual cycle (Ray et al., 2019).

The study completed by Ray et al. (2019) had a few limitations. First, there was no comparison group and, as such, there was no comparison to women with schizophrenia outside of mental health facilities or other geographic locations (Ray et al., 2019). Although the study assessed individual positive symptoms, it did not consider suicide, so the relationship of suicide to positive symptoms throughout the menstrual cycle is unknown (Ray et al., 2019). This study did not look at schizophrenia symptoms without treatment intervention, so it is difficult to determine if levels of hormones or treatment altered symptom scores during menstrual cycles (Ray et al., 2019). The study did not measure hormone levels, so even though there is a connection between the menstrual cycle and positive symptoms, we do not know exactly how they are connected or how they may have influenced the PANSS (Kay et al., 1987) test results. Finally, all women who participated in the study were given medication issued by the health care facility to mediate schizophrenia symptom expression, which could have influenced the PANSS (Kay et al., 1987) test results (Ray et al., 2019).

A strength of the Ray et al. (2019) study was its adequate size sample (N = 40), which allowed for more statistical power so that the study could appropriately detect group differences and apply research results to more individuals with schizophrenia. This study only used women with schizophrenia, which allowed the researchers to explore issues related to women, since most research studies include more male participants (Ray et al., 2019). The researchers used the ICD-10 DCR (WHO, 1992), which is a universally-accepted and standard diagnostic manual consulted by clinicians and researchers, to diagnose schizophrenia (Ray et al., 2019). The researchers utilized the PANSS (Kay et al., 1987), which is a standardized assessment tool, to measure positive and negative symptoms, which increased the validity of test results (Ray et al., 2019). The study design was a prospective study conducted over a 15-month period, which allowed the researchers to collect baseline data for comparison to data collected and evaluated over other time periods (Ray et al., 2019). Ray et al. (2019) were able to reduce external confounds that may alter test results, such as participants with intellectual disability, those with severe gynecological disorders, and those on birth control, by excluding participants with such histories. Overall, the Ray et al. (2019) study was able to suggest biological differences in women with schizophrenia related to the menstrual cycle and symptomatology.

Other studies explored biological risk factors related to schizophrenia, schizoaffective disorder (depressive subtype), suicide, and gender differences. The first study by De Luca et al. (2010) looked at the hypothalamic-pituitary-adrenal (HPA) axis, a component of the nervous system that functions in conjunction with the endocrine system to regulate stress response. De Luca et al. (2010) examined HPA axis genes to explore a potential predisposition for suicide among 231 participants (64 women and 167 men) diagnosed with schizophrenia, 35% of whom reported previous suicide attempts, in a Toronto, Canada psychiatric hospital. Unlike in the

general population (Drapeau & McIntosh, 2017) or other schizophrenia studies (Fuller-Thomson, 2016), being male was a risk factor for attempts in this sample (x^2 (1, N = 231) = 0.20, p = 0.657; De Luca et al., 2010). However, there were more male participants, which might explain more attempts by males (De Luca et al., 2010). Results further indicated a significant relationship between the HPA axis gene (CRHBP), which is responsible for cellular response to a variety of medications and treatments that utilize the corticotropin-releasing hormone, and an increased risk for suicide attempts (p = 0.035; De Luca et al., 2010). The researchers also observed decreased risk for attempts between the NC3R1 axis gene, where cortisol and glucocorticoids bind, and suicide attempts (x^2 (1, N = 231, p = 0.0363; De Luca et al., 2010). There was also a significant interaction between HPA axis genes, CRHR1, and CRHBP (x^2 (1, N = 231, p = 0.002); however, the adjusted P value was not significant (p = 0.179; De Luca et al., 2010). In summary, the findings of De Luca et al. (2010) suggested individuals with schizophrenia who also have certain HPA axis genes, such as CRHR1 and CRHBP, which aid in the release of the stress hormone cortisol, are more vulnerable to engage in suicide attempts compared to those who do not have these genes. Also, the De Luca et al. (2010) study suggested that individuals with schizophrenia with the NC3R1 gene are less likely to engage in suicide attempts.

Limitations were present in the De Luca et al. (2010) study. First, the study did not assess positive symptoms, so their relationship to suicide is unknown in participants who had one or more of the six HPA axis genes studied (De Luca et al., 2010). The researchers assessed suicide by using a five-point scale, with 1 for thoughts and 5 for a violent attempt, rather than a standardized diagnostic tool (De Luca et al., 2010). The study found no relationship between individual genetic markers and suicide, so authors concluded their results could not be generalized to disorders other than schizophrenia (De Luca et al., 2010). The study did not

separate results by diagnosis, so the sample was not purely participants with schizophrenia since it also contained participants with schizoaffective disorder, which affected the ability to generalize results to a larger population with schizophrenia (De Luca et al., 2010).

A strength in the De Luca et al. (2010) study was the data collection, since the sample size (N = 231) was large, which increased statistical power or the ability to determine group differences. The case-control design was ideal because it allowed the researchers to study via observation participants with a severe mental illness and with whom it may be difficult to obtain follow-up data (De Luca et al., 2010). Having comparison groups reduced the likelihood of alternate explanations for suicide attempts (De Luca et al., 2010). Another benefit of using a case-control design was that this study was one of the only studies of its kind at the time it was conducted, which can provide useful, preliminary data for larger, subsequent studies (De Luca et al., 2010). The researchers managed to reduce external confounding variables, such as neurological disorders, head injuries, or substance abuse, by excluding participants with such conditions (De Luca et al., 2010). By using standardized assessment and diagnostic tools, such as the Structured Clinical Interview for DSM-IV (SCID-I; First, Spitzer, Gibbon, & Williams, 1996) and DSM-IV (APA, 1994), to assess symptoms and diagnose schizophrenia, the researchers increased the validity of their results (De Luca et al., 2010). More than one study psychiatrist reviewed the clinical interviews and assessment data, and diagnoses were given according to a consensus, which further improved the quality of data collected and increased inter-rater reliability between diagnosing clinicians. De Luca et al. (2010) were able to surmise that participants with the CRHBP gene were more likely to attempt suicide, and participants with the NC3R1 gene were less likely to attempt suicide, which could allow mental health providers to incorporate more suicide prevention measures into treatment plans.

In another study, Lewis et al. (1996) looked at 96 participants (30 women and 66 men) with schizophrenia to explore possible relationships between three groups (no suicide thoughts or attempts, suicide thoughts without attempts, and suicide attempts), rapid eye movement (REM), and cortisol levels as measured by a dexamethasone suppression test (DST). The researchers recruited unmedicated participants from an outpatient schizophrenia program at a university in Michigan and performed a follow-up assessment after one year (Lewis et al., 1996). Results indicated a significant relationship between suicide and an increase in total REM sleep time (r(95) = 0.40, p = <0.001), total REM activity ($p < 0.05$), and male sex (r(95) = 0.50, p = <0.001; Lewis et al., 1996). The study found that neither positive nor negative symptoms were predictive of suicidal thoughts or behaviors; however, depression scores, measured by the Hamilton Depression Rating Scale (HDRS; Hamilton, 1960), correlated with suicidal thoughts and behaviors ($p < 0.01$; Lewis et al., 1996). In summary, the Lewis et al. (1996) findings suggested men with schizophrenia who had more REM sleep time and activity were at an increased risk for suicide. However, Lewis et al. (1996) were unable to determine that negative or positive symptoms of schizophrenia predicted suicide; rather, they discovered a correlation between depression and suicide among the population of interest.

The Lewis et al. (1996) study was subject to limitations. The researchers recruited participants from an outpatient schizophrenia facility in Michigan, so results may not be generalizable to untreated suicidal individuals with schizophrenia in other geographic locations (Lewis et al., 1996). Study participants were medication-deficit, so it is unknown how medication would affect suicide or positive symptoms (Lewis et al., 1996). The researchers did not explore the relationship of individual positive symptoms to suicide, as the study only looked at total positive symptom severity and suicide (Lewis et al., 1996). The fact that the researchers

assessed the participants for sleep issues could alter results, since those without potential sleeping problems may have been excluded from the study or could have been used as a comparison group (Lewis et al., 1996). Ninan et al. (1984) found lower serotonin among suicidal individuals with schizophrenia compared to non-suicidal individuals with schizophrenia and also suggested that increased serotonin reduced rapid eye movement (REM) sleep. Virkkunen et al (1989) found that an overproduction of serotonin led to more violent methods for suicide.

A strength of the Lewis et al. (1996) study was the adequate sample size (N = 96), which increased the ability to detect statistical differences between groups and the applicability of study results to more individuals with schizophrenia. Another strength included clinicians being blinded to data related to the DST results or sleep information, which reduced researcher bias (Lewis et al., 1996). The researchers also attempted to reduce external confounding variables, such as other sleep-related issues, by excluding the first night of the sleep study from the analyses and excluding participants whose primary diagnosis was a sleep disorder, participants who had a medical diagnosis that could alter the dexamethasone suppression test (DST) results, participants who had drug or alcohol abuse or dependency, and participants who were taking any form of antipsychotic medication (Lewis et al., 1996). Having a one-year follow-up period allowed researchers to explore pre- and post-effects of the dexamethasone suppression test on cortisol and sleep as they related to suicide risk (Lewis et al., 1996). The study used standardized assessment and diagnostic tools, such as the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott & Spitzer, 1978), the SANS (Andreasen, 1989), the BPRS (Overall & Gorham, 1962), the HDRS (Hamilton, 1960), the DSM-III-R (APA, 1987), and the RDC (Spitzer et al., 1978), which increased the validity of study results (Lewis et al., 1996). The study drew upon multiple sources of data, such as clinical interviews, psychological assessments, and medical

records, to corroborate study findings, which increased the validity of research results (Lewis et al., 1996). In summary, male participants who slept longer during the REM stage of sleep were at a higher risk for suicide (Lewis et al., 1996).

The last biological study by Nopoulos et al. (1997) explored gender differences in brain structure among 80 individuals with schizophrenia (40 women and 40 men) and compared them to a healthy control group of 80 people. The researchers recruited participants with schizophrenia from an inpatient university research hospital in Iowa and recruited healthy controls from the community via a local newspaper (Nopoulos et al., 1997). The study used Magnetic Resonance Imaging (MRI) to look at brain tissue volume and structure and employed standardized assessment tools to assess symptom severity (Nopoulos et al., 1997). Study results determined significant gender differences in age of onset of schizophrenia in the patient group: 20.8 years for men with schizophrenia, and 23.6 years in women with schizophrenia ($p < 0.05$; Nopoulos et al., 1997). There were no gender differences in positive or negative symptom severity (Nopoulos et al., 1997).

There was also a significant interaction between gender and diagnosis with regard to ventricular volume, with male participants with schizophrenia having larger ventricles, as measured by cerebral spinal fluid (CSF) volume, than female participants with schizophrenia ($F = 4.66$, $df = 1, 155$, $p = 0.03$; Nopoulos et al., 1997). Post hoc results revealed significant differences between the male participants with schizophrenia group and the healthy male participant group; total mean brain tissue volume was smaller among the healthy male controls (1284 cc compared to 1318 cc), mean frontal tissue volume was smaller among the healthy male controls (413 cc compared to 431 cc), and mean temporal tissue volume was smaller among the healthy male controls (241 cc compared to 248 cc; Nopoulos et al., 1997). There were also

significant differences in total, surface, and ventricle CSF volumes between male participants with schizophrenia having larger total CSF volume, 158 cc compared to 124 cc, in healthy male controls, male patients having larger surface CSF volume, 140 cc compared to 112 cc, in healthy male controls, and male patient group having larger ventricular CSF volume, 18.3 cc compared to 12.2 cc, in healthy male controls (Nopoulos et al., 1997). However, female participants with schizophrenia exhibited significantly smaller frontal lobe tissue, 368 cc, compared to 381 cc in healthy female controls, and larger total CSF volume in female patient group, 155 cc compared to 129 cc in healthy female controls, and larger surface CFS volume in female patients, 141 cc compared to 116 cc, in healthy female control group (Nopoulos et al., 1997).

There were limitations in the Nopoulos et al. (1997) study. First, the patient samples consisted of individuals from an inpatient population, so the results may not be generalizable to individuals with schizophrenia in an outpatient setting or those not receiving treatment (Nopoulos et al., 1997). Since the researchers recruited participants from a mental health research facility in Iowa, both the researchers and participants could be subject to expectation bias, and the results may not be generalizable to individuals with schizophrenia in other locations (Nopoulos et al., 1997). The study did not explore individual positive symptoms or suicide (Nopoulos et al., 1997). Even though the study did assess positive and negative symptoms, the researchers only used the sum of the global scores to evaluate severity of the schizophrenia rather than individual symptomatology (Nopoulos et al., 1997).

A strength of the Nopoulos et al. (1997) study was its large sample size (N = 160), which adequately represented most individuals with schizophrenia. The study's use of comparison groups reduced the likelihood of alternate reasons for differences in brain structures (Nopoulos et al., 1997). There were equal numbers of male and female participants in patient and control

groups, so gender and group differences were more accurately assessed (Nopoulos et al., 1997). Three psychiatrists diagnosed all participants with schizophrenia using the DSM-III-R (APA, 1987), which increased inter-rater reliability and standardized diagnoses (Nopoulos et al., 1997). The study used standardized assessment measures, such as the SAPS (Andreasen, 1984) and the SANS (Andreasen, 1989), to assess positive and negative symptoms, which increased the validity of results(Nopoulos et al., 1997). In summary, Nopoulos et al. (1997) were able to determine obvious structural brain differences between male and female individuals with schizophrenia in both patient and control groups. Due to the known differences in brain structure between men and women with schizophrenia compared to healthy controls, it is critical to understand how positive symptoms are related to suicide risk among those with schizophrenia.

Biological factors have a known influence on suicide risks for individuals with schizophrenia. The symptoms of schizophrenia tend to fluctuate during various stages of the menstrual cycle in females, which suggests an association between hormones and symptomatology (Ray et al., 2019). Although difficult to isolate because of confounding variables, evidence suggests that suicidal behaviors increase when HPA axis and associated genes (CRHBP and NC3R1) function irregularly (De Luca et al., 2010). Participants with the CRHBP gene were more likely to attempt suicide, but participants with the NC3R1 gene were less likely to attempt suicide (De Luca et al., 2010). Furthermore, the Lewis et al. (1996) study examined biological factors, such as rapid eye movement (REM) and cortisol levels, to determine correlation with suicide rates in individuals with schizophrenia. Male participants who slept longer during the REM stage of sleep were at higher risk for suicide (Lewis et al., 1996). Lastly, structural brain abnormalities were evident between men and women with schizophrenia compared to healthy controls (Nopoulos et al., 1997).

Gender-Related Risk Factors

Gender and How It Is Different in Suicidal Individuals with Schizophrenia

Several research studies explored gender differences among suicidal people with schizophrenia. The first two studies indicated that men with schizophrenia had higher rates of suicide (Kaplan et al., 2016; Høye et al., 2011), and the third study indicated men with schizophrenia had more suicide deaths, while women with schizophrenia had more suicide attempts (Limosin et al., 2007), which is consistent with suicidal individuals in the general population.

Kaplan et al. (2016) examined 97 individuals with schizophrenia (31 women and 66 men), 45 individuals with schizoaffective disorders (21 female and 24 male), 102 individuals with nonpsychotic major depressive disorder (65 female and 37 male), and 53 individuals with a bipolar disorder (29 women and 24 men). The researchers studied suicidal activity, defined as a range of suicidal thoughts and behavior severity, from no suicidal thoughts to suicidal thoughts, attempts, and completions over 20 years following an initial inpatient stay (Kaplan et al., 2016). The researchers recruited the participants from the Chicago Follow-Up Study (Westermeyer & Harrow, 1989) as part of a prospective study design (Kaplan et al., 2016). They determined diagnoses using the RDS (Spitzer et al., 1978), the SADS (Endicott & Spitzer, 1978), and the Schizophrenia State Interview ESSII (Grinker & Harrow, 1987), a semi-structured, tape-recorded interview that had inter-rater reliability (Kappa=0.88) for a schizophrenia diagnosis (Kaplan et al., 2016). The researchers also used the SADS (Endicott & Spitzer, 1978) to assess for suicide attempts, with a score of 6 or 7 on one of the suicide questions and assessed suicide thoughts with a score of 5 on a question related to a plan and method (Kaplan et al., 2016). A second look at suicide by researchers was evaluated and scored as a weighted mean, using a 4 for completion,

3 for attempt, 2 for thoughts, and 1 for no suicide activity (Kaplan et al., 2016). An earlier study had also supported the validity of this measure of suicide activity (Kaplan et al., 2012).

Results indicated that 10 of the 11 (91%) male individuals with schizophrenia who completed suicide died within the first 4.5 years after their first hospital admission (Kaplan et al., 2016). Among female individuals with schizophrenia, four of the five (80%) who completed suicide died within the first 4.5 years following their first hospitalization ($x^2 = 1$, N = 16) = 8.04, $p < .01$; Kaplan et al., 2016). There were no differences between males (53%) and females (51.6%) with schizophrenia when looking at overall suicide activity (suicidal thoughts, attempts, and completions) over the 20-year period, compared to other diagnostic categories (Kaplan et al., 2016). However, the suicidal activity scores of men with schizophrenia tended to decrease over time, with 59% who showed a maximum suicide score in the early phase of the study, 32% who showed a maximum suicide score in the middle of the study period, and only 9% who showed a maximum suicide score in the last phase of the study (Kaplan et al., 2016). In comparison, 44% of women with schizophrenia revealed a maximum suicide score in the early phase of the study, 22% showed a maximum suicide score in the middle of the study period, and 33% showed a maximum suicide score in the later phase of the study (Kaplan et al., 2016).

One of the most important limitations for this review is that the study did not specifically measure positive symptoms (Kaplan et al., 2016). Nor did the study measure symptoms prior to the participants' first hospitalization, so it is unknown which symptoms led to an inpatient stay in a psychiatric facility (Kaplan et al., 2016). The age range of participants at hospital admission was 16 to 32 years, but the study did not specify participant ages by gender, so it is unclear as to which stage of the illness each participant was in, which could provide further gender differences (Kaplan et al., 2016). The researchers studied the participants during hospitalization and at

follow-ups (Kaplan et al., 2016). They conducted follow-ups in six different intervals, 2 years, 4.5 years, 7.5 years, 10 years, 15 years, and 20 years, rather than annually, so external confounding variables in between follow-up periods could have altered symptomatology and study results (Kaplan et al., 2016). The study did not mention attrition rates, which is a problem for a longitudinal study, since losing participants over such a long period of time can alter the study results and reduce its validity (Kaplan et al., 2016).

A strength of the Kaplan et al. (2016) study was the adequate sample size (N = 97), which increased statistical power, enhanced the ability to detect group differences, made the results more generalizable to other populations, and increased the validity of the results. It appears that participants were the same throughout the study, since the participants were from a previous study, the Chicago Follow-Up Study (Westermeyer & Harrow, 1989), which increased the validity of the results. The longitudinal, prospective design allowed the researchers to identify and follow symptoms over a long period of time with follow-up periods, so they were able to identify associated risk factors, which enhanced the validity of the data. They used standardized diagnostic tools to diagnose schizophrenia, such as the RDC (Spitzer et al., 1978), the SADS (Endicott & Spitzer, 1978), and the Schizophrenia State Interview ESSII (Grinker & Harrow, 1987), which increased the validity of the study results (Kaplan et al., 2016). In summary, the Kaplan et al. (2016) study was able to surmise that men with schizophrenia are at the highest risk for death by suicide in the early stages of their illness, while the risk for death by suicide in women with schizophrenia fluctuates throughout their illness, which clinicians should consider as part of treatment planning.

Høye et al. (2011) investigated the deaths of 1,111 individuals with schizophrenia who were admitted to a psychiatric hospital in Norway over 27 years to assess gender differences in

death rates. Thirty-eight percent of participants were women and 62% were men (Høye et al., 2011). Before 1985, the researchers used the ICD-8 (WHO, 1967) to diagnose schizophrenia (Høye et al., 2011). After 1985, they used the ICD-9 (WHO, 1978) to diagnose schizophrenia (Høye et al., 2011). They used the ICD-10 (WHO, 1992) to classify all deaths (Høye et al., 2011). Results indicated a high standard mortality ratio (SMR), which is the ratio of observed deaths to expected deaths: 17.0 (95% CI: 12.8 to 22.4) for men and women combined for suicide-related deaths (Høye et al., 2011). The SMR for men with schizophrenia who died by suicide between 1980 and 2006 was 17.5 (95% CI: 12.8 to 23.8), and for women it was 15.0 (95% CI: 7.8 to 28.7, $p = 0.7$), but the difference between genders was not statistically significant (Høye et al., 2011). Also, the study attributed 3.5% of all deaths to suicide among men with schizophrenia, while it attributed 0.8% of all deaths to suicide among women (Høye et al., 2011). The most significant finding was the astronomical increase in SMR for women, whose first inpatient admission between 1980 and 1992 was 9.6 (95% CI: 4.0 to 23.0) and from 1993 to 2006 was 50.2 (95% CI: 18.8 to 133.6; Høye et al., 2011). This signifies a 1.7 times total age-controlled increase in mortality between the two groups (Høye et al., 2011). According to the study authors, this increase in SMR suggested that the lack of improvements in mental health treatment over time attenuated suicide deaths and psychiatric hospitalizations could serve as a protective factor (Høye et al., 2011). The researchers also noted that results related to the significant increase in SMR for women should be interpreted with caution due to the low number of actual suicide deaths (Høye et al., 2011).

The Høye et al. (2011) study had some limitations. It did not include untreated individuals with schizophrenia and those with less severe symptomatology, which could impact the study results. Fewer individuals with schizophrenia were hospitalized after 1992 due to

deinstitutionalization in Norway and the formation of outpatient community facilities (Høye et al., 2011). Further, the study method consisted of analyzing death registers, so clinical interviews with living participants were not possible (Høye et al., 2011). Conducting living interviews may have provided more comprehensive results related to suicide risk. Since the study occurred over a 27-year period, the participants may have been subject to cohort effects, such as differences in socioeconomic status or education levels, which could impact their access to care and lead to different study results. Finally, the study did not specifically assess positive symptoms, so the results did not address their role in suicide risk among the population of interest (Høye et al., 2011).

The study had a large sample size (N = 1111), so the findings were more generalizable to most individuals with schizophrenia, and the ability to detect group differences was higher, which increased validity of study results (Høye et al., 2011). Benefits of the longitudinal design included the ability to identify and track changes in symptoms and related risk factors over a longer period of time (Høye et al., 2011). Another benefit of the longitudinal death registers design was there was minimal loss of participants during follow-up periods (Høye et al., 2011). Even though the researchers used multiple diagnostic tools over the course of the study, they converted diagnoses from before 1985, which utilized the diagnostic criteria from the ICD-8 (WHO, 1965), to the ICD-9 (WHO, 1978; Høye et al., 2011). By converting these participants' diagnoses, the researchers attempted to treat schizophrenia as a stable construct (Høye et al., 2011). Høye et al. (2011) were able to determine that total suicide deaths were high for men and women with schizophrenia combined, there were more suicide-related deaths in men than in women, and the progression of mental health care in Norway has not abated the risk for suicide-

related deaths among the population of interest, all of which clinicians and future researchers should consider.

Limosin et al. (2007) studied 3,434 death certificates of individuals in France with schizophrenia to assess prevalence and predictors for suicide. The sample included 1,242 female and 2,192 male individuals with schizophrenia (Limosin et al., 2007). Participants included those born in France who participated in inpatient or outpatient treatment at public psychiatric departments (Limosin et al., 2007). The ICD-10 (WHO, 1992) was used to diagnose schizophrenia, and the ICD-9 (WHO, 1978) was used to classify deaths (Limosin et al., 2007). Inclusion of participants started in 1993, and the researchers made subsequent annual contacts to participating mental health providers to determine deaths of participants through December of 2002 (Limosin et al., 2007). Results indicated that 36.4% of women in the sample had a history of suicide attempts, while 31.2% of men in the study had a history of suicide attempts (Limosin et al., 2007). More men (N = 112) died due to suicide (SMR = 15.8 [13.7 to 18.2]) versus women (N = 29; SMR = 17.7 [13.6 to 23.1]; Limosin et al., 2007).

Limitations were evident in the Limosin et al. (2007) study. For instance, over the 10-year study period, cohort effects, such as changes in socioeconomic status, may have occurred, which could have led to changes in suicidal thoughts and behaviors and yielded different study results (Limosin et al., 2007). Also, participants had to be in an inpatient or outpatient setting in France, so individuals with schizophrenia who were not receiving treatment or in other geographic areas were not included (Limosin et al., 2007). Finally, this study did not assess positive symptoms or their impact on suicide risk among the population of interest (Limosin et al., 2007).

A strength of the Limosin et al. (2007) study was its large sample size using death certificates, so it did not lose any participants over its course. Also, having a large number of participants increased both the statistical power and ability to detect group. More specifically, the study found more accurate gender differences due to its larger sample size. The large sample size also made the study results more representative of most individuals with schizophrenia. The longitudinal study design allowed the researchers to examine changes in symptoms and identify risk factors that may be related over a 10-year period. The study used standardized diagnostic classification manuals, so participant diagnoses were consistent. Using standardized assessment measures, such as the ICD-9 (WHO, 1978) and ICD-10 (WHO, 1992), increased the validity of study results. In summary, Limosin et al. (2007) found that women with schizophrenia had higher rates of suicide attempts, while men with schizophrenia had higher rates of suicide deaths.

Contrary to the previous findings that men have higher rates of suicidal deaths (Høye et al., 2011; Kaplan et al., 2016; Limosin et al., 2007), two other studies indicated that women with schizophrenia were at higher risk for suicide (Carlborg et al., 2010; Lyu & Zhang, 2014). Carlborg et al. (2010) examined 224 hospitalized individuals (147 women and 77 men) with schizophrenia in Sweden to study suicide attempts and deaths over 25 years. The researchers found that 39% of women and 32% of men attempted suicide during the study period (Carlborg et al., 2010). Results also determined that 89% of women and 78% of men who died from suicide had a previous suicide attempt history, but the difference between women and men was not statistically significant (Carlborg et al., 2010). Another finding indicated there was a relationship between previous attempts and suicide deaths both in men ($p = 0.0043$) and women ($p = 0.0023$; Carlborg et al., 2010). The probability that a suicide death would occur following a previous attempt was 28% in men and 14% in women (Carlborg et al., 2010). Odds ratios of attempters

versus non-attempters were 14.53 for women (95% CI [1.77 – 119.60]) and 9.72 for men (95% CI [1.85–51.20]; Carlborg et al., 2010).

The Carlborg et al. (2010) study had some limitations. The data collection only included individuals who were inpatient in psychiatric facilities in Stockholm, Sweden, so the results may not be generalizable to individuals with schizophrenia who were not receiving inpatient treatment in other locations. Since the researchers asked hospital patients to participate in a research study, both the participants and researchers were potentially subject to expectation bias, which could have altered a researcher's ratings or opinions or a participant's behaviors. Hospitalization selection criteria only included the more severe cases since they were inpatient, so results may not be generalizable to individuals with schizophrenia with less severe symptoms or impairment. The study did not mention exclusion criteria, so it is unclear how the researchers controlled for external confounding variables, such as comorbid psychiatric disorders or head injuries, which could increase suicidal thoughts and behaviors. Women were overrepresented in the study, so gender differences may not be accurate. The researchers did not assess schizophrenia symptoms, specifically positive symptoms, throughout the study or follow-up period, nor did they consider how positive symptoms relate to suicide. The study did not mention the manner in which the researchers diagnosed participants with schizophrenia, so the researchers could have diagnosed some participants incorrectly if they did not use a standardized diagnostic tool. The study did not include suicide attempts that resulted in death, so it could have underreported the number of suicide attempts and deaths. Death registers and medical records were the sole source of information to determine suicide-related information, so first-hand accounts related to suicide intent by living individuals were therefore not available, which could have altered the results (Carlborg et al., 2010).

A strength of the Carlborg et al. (2010) study was its large sample size (N =224), which increased the statistical power and ability to detect group differences, such as those between genders. The large sample size also increased the applicability of the study's findings to most individuals with schizophrenia. Follow-ups throughout the 25-year period allowed the researchers to explore the relationship between previous suicide attempts and deaths among participants, as well as any associated risk factors for each gender. The longitudinal study design eliminated attrition or loss of participants, which increased the validity of the results. Two psychiatrists determined suicide attempts through medical records, so having more than one person diagnosing participants increased the reliability and validity of the diagnosis. Since there were more women than men in the study, the researchers were able to more thoroughly explore issues related to suicidal women with schizophrenia (Carlborg et al., 2010).

Lyu and Zhang (2014) looked at autopsy records of (N =392) individuals who died by suicide in China to assess characteristics between those diagnosed with schizophrenia (n =38), another mental disorder (n =150), and those with no mental health diagnosis (n =204). Among the participants with schizophrenia, 23 were women and 15 were men (Lyu & Zhang, 2014). The researchers recruited all participants from 16 rural areas in three Chinese provinces as part of a large case control study that utilized a psychological autopsy format (Lyu & Zhang, 2014). The researchers used the Beck Hopelessness Scale (BHS; Beck & Steer, 1988, 1993) to assess hopelessness, the HDRS (Hamilton, 1960) to assess depression, and the Beck Suicide Intent Scale (SIS; Beck, Schuyler, & Herman, 1974) to assess suicidal intent (Lyu & Zhang, 2014). For interview and diagnostic purposes, the researchers used the SCID-IV (First et al., 1996). Since China did not have a medical examiner, project managers from the Centers for Disease Control and Prevention (CDC) retrieved suicide data on each deceased participant from health agencies,

village physicians, and hospitals in each of the 16 rural areas (Lyu & Zhang, 2014). Results indicated that being a woman with schizophrenia (60.5%) in rural China is a risk factor for suicide compared to men with schizophrenia (39.5%; Lyu & Zhang, 2014).

The authors in the Lyu and Zhang (2014) study did not elaborate on sociodemographic issues regarding differences in suicide rates between men and women. However, another large survey study on 1,909,205 adults in China on schizophrenia disabilities indicated higher prevalence rates of schizophrenia among rural women (51%) compared to rural men (38%; Liu et al., 2015). In addition to higher prevalence rates of schizophrenia among rural Chinese women, the study authors suggested that a possible lack of access to health care could contribute to poorer outcomes (Liu et al., 2015). However, the Liu et al. (2015) study did not assess positive symptoms or suicide; it only provided a potential explanation for increased prevalence of disease rates among rural Chinese women with schizophrenia but did not include this explanation in its main literature review.

Limitations were apparent in the Lyu and Zhang (2014) study. Even though there were 392 total participants, there were only 38 participants with schizophrenia, so results related to schizophrenia may have been underrepresented. There were more female than male participants with schizophrenia, so results for male individuals with schizophrenia may have been underrepresented, while results for female individuals with schizophrenia may have been overrepresented (Lyu & Zhang, 2014). The study did not measure positive symptoms or consider their possible relationship to suicide or gender (Lyu & Zhang, 2014). How gender influenced suicide or positive symptoms among participants from various rural counties and three provinces in China is unknown because the study did not assess or discuss cultural factors (Lyu & Zhang, 2014). No other medical record system was available to assess symptoms prior to death (Lyu &

Zhang, 2014). The researchers administered clinical interviews and assessments to friends and family, who could provide biased accounts of the deceased patients' symptoms or intent to die by suicide (Lyu & Zhang, 2014). The researchers conducted these family-friend interviews two to six months after the death of each participant, so reports provided could be inaccurate due to the length of time between when participant's death and the interview (Lyu & Zhang, 2014). Since there were no medical examiners in China, the researchers had to rely on village doctors, health agencies, and hospitals to receive death information from the community (Lyu & Zhang, 2014).

A strength of the Lyu and Zhang (2014) study was its large sample size (N = 392), which increased the generalizability and validity of the study's results. A large sample size also increased the ability to detect statistical differences between groups, such as gender (Lyu & Zhang, 2014). The researchers were able to control for external confounding variables by excluding any participants whose reasons for death were undetermined, which increased the study's validity (Lyu & Zhang, 2014). Also, using a standardized assessment and diagnostic tool, such as the SCID-IV (First et al., 1996), to diagnose schizophrenia increased the validity of participant diagnoses (Lyu & Zhang, 2014). Using other standardized assessment tools, such as the BHS (Beck & Steer, 1993), the HDRS (Hamilton, 1960), and the SIS (Beck et al., 1974) increased the validity of the test results (Lyu & Zhang, 2014). Using family-friend interviews to corroborate clinical findings improved the accuracy of study results (Lyu & Zhang, 2014). In summary, Lyu and Zhang (2014) and Liu et al. (2015) were both able to identify differences in gender among suicidal individuals with schizophrenia.

There was a total of five studies that explored gender differences among suicidal individuals with schizophrenia (Carlborg et al., 2010; Høye et al., 2011; Kaplan et al., 2016; Limosin et al., 2007; Lyu & Zhang, 2014). All of the studies had large sample sizes; the three

from Europe (Carlborg et al., 2010; Høye et al., 2011; Limosin et al., 2007) had the largest sample sizes, followed by the one from Asia (Lyu & Zhang, 2014) and the one from the U.S. (Kaplan et al., 2016), which had the smallest sample size. Four of the five studies were published in the past 10 years (Carlborg et al., 2010; Høye et al., 2011; Kaplan et al., 2016; Lyu & Zhang, 2014), with the U.S. study (Kaplan et al., 2016) being the most recent and the French study (Limosin et al., 2007) being the oldest.

The results of the studies indicated gender-specific risk factors for suicide in individuals with schizophrenia. Overall, men with schizophrenia were more likely to complete suicide attempts resulting in death, compared to their female counterparts (Høye et al., 2011; Limosin et al., 2007), more men actually died by suicide compared to women, but the gender differences were not statistically significant (Høye et al., 2011), and more men died earlier following their initial inpatient stay compared to women (Kaplan et al., 2016). However, women were more likely to have suicidal ideation and unsuccessfully attempt suicide (Atalay & Atalay, 2006; Carlborg et al., 2010; Limosin et al., 2007). Two studies found more women died by suicide than men (Carlborg et al., 2010; Lyu & Zhang, 2014), one of which demonstrated women also having a history of attempts prior to their deaths (Carlborg et al., 2020). The age of onset in women was later than in men (Atalay & Atalay, 2006; Chaves et al., 1993; Nopoulos et al., 1997; Usall et al., 2001). Although, on average, men with schizophrenia completed suicide more than women, some evidence suggested that cultural or demographic components existed in some societies. The influence of these socio-cultural components could result in women completing suicides far more often than their male counterparts within the same demographic. These findings should also be interpreted with caution, as the studies where more men died by suicide had twice as

many male as female participants, and in the studies where more women died, there were more female than male participants.

The Relationship of Positive Symptoms and Suicide by Gender

The risk of suicide among individuals with schizophrenia increases with the expression of positive symptoms, such as hallucinations, depressive behaviors, and delusions. As such, the importance of understanding how positive symptoms affect both men and women with schizophrenia and their risk factors for suicidal thoughts and behaviors are important for prevention and treatment planning. Three studies that explored the relationship between positive symptoms and suicide among individuals with schizophrenia also focused on gender differences (Abdollahian et al., 2009; Kaplan et al., 2012; Tang et al., 2007).

The first study by Kaplan et al. (2012) looked at 74 individuals with schizophrenia (23 women and 51 men) and 77 individuals with major depressive disorder (51 women and 26 men) to determine gender-related risk factors for suicide. The participants were those who sought treatment and were from the Chicago Follow-Up Study (Westermeyer & Harrow, 1989), a longitudinal study investigating schizophrenia (Kaplan et al., 2012). Results indicated that 28 (55%) of the men with schizophrenia and six (27%) of the women with schizophrenia reported positive symptoms at the 2-year follow-up (Kaplan et al., 2012). Eleven of the 28 (39.3%) men with schizophrenia but none of the women with schizophrenia displayed suicidal activity 5.5 years later (Fisher's exact, $p < .05$; Kaplan et al., 2012). The researchers attributed suicidal ideation to delusions ($x^2 = 1$, $N = 74$) $= 5.11$, $p < .05$) rather than hallucinations (Kaplan et al., 2012).

There were limitations in the Kaplan et al. (2012) study. Because participants were part of a treatment-seeking population, subsequent results may not generalize to non-treatment

seeking suicidal individuals with schizophrenia in other geographic areas. There was an uneven number of male and female participants, so the study did not accurately explore gender differences. This study did not measure all positive symptoms, as it only assessed hallucinations and delusions, and did not explore the relationship between positive symptoms and suicide. The study only assessed the presence or absence of suicidal activity versus individual aspects of suicide (ideation, attempts or completions); it did not correlate aspects of suicide with schizophrenia symptoms (Kaplan et al., 2012). Finally, the participants studied over a 5.5-year period were potentially subject to cohort effects, such as education, especially since education was obtained at baseline, which could also alter study results (Kaplan et al., 2012).

A strength of the Kaplan et al. (2012) study was its adequate sample size (N = 74), which allowed the research results to be more applicable to most individuals with schizophrenia and increased the statistical power and the ability to detect statistical group differences. The prospective design was ideal for exploring future risk because participants were not privy to desired outcomes at baseline, which could have otherwise biased their assessment responses and study results. Tapping participants from a previous study reduced attrition among participants, since contact methods were previously established, which facilitated ease of the follow-up process. The study used a comparison group of participants with major depressive disorder, which reduced alternate explanations for suicide risk among individuals with schizophrenia (Kaplan et al., 2012). This study used standardized assessment tools, such as the RDC (Spitzer et al., 1978), the SADS (Endicott & Spitzer, 1978), and the Schizophrenia State Interview ESSII (Grinker & Harrow, 1987), to determine diagnosis and assess symptoms, which increased the validity of study results. The researchers used chart reviews and family interviews as collateral data, which also increased the validity of the study's findings (Kaplan et al., 2012).

In summary, Kaplan et al. (2012) were able to determine that men with schizophrenia who experienced poor early life functioning were at greater risk for suicide later in life (5.5 years later), but this finding was not evident among women with schizophrenia. Since it is known that poor early functioning as well as experiencing delusions and hallucinations early in the course of the illness are related to subsequent suicide in men with schizophrenia, it is imperative to also gain a better understanding of the role all positive symptoms play in order to mitigate suicide risk and develop more efficacious treatments for at-risk populations.

In the second study, Abdollahian et al. (2009) used a cross-sectional design to compare 65 individuals with schizophrenia to 65 patients with major depressive disorder with psychotic features in Iran to study the association of positive and negative symptoms and psychotic depression with suicide. There was a total of 42 male and 23 female participants (Abdollahian et al., 2009). Participants were randomly selected from a list of inpatients in an Iranian psychiatric hospital between 2006 and 2007 (Abdollahian et al., 2009). The researchers administered the PANSS (Kay et al., 1987) to assess positive and negative symptoms, used the Risk Estimator for Suicide (Motto et al., 1985) to assess risk of suicidal thoughts and behaviors as well as history of attempts, and consulted the DSM-IV-TR (APA, 2000) for diagnostic purposes (Abdollahian et al., 2009). Results indicated that both men ($r(64) = 0.659$, $p = <0.0001$) and women ($r(64) = 0.801$, $p = <0.0001$) with schizophrenia who experienced more positive symptoms were more likely to engage in suicide, with female individuals with schizophrenia at a slightly higher risk for suicide (Abdollahian et al., 2009). Men ($r= -0.52$, $p<0.0001$) and women ($r= -0.556$, $p<0.0001$) with schizophrenia who experienced negative symptoms were less likely to engage in suicidal thoughts or behaviors (Abdollahian et al., 2009).

There were some limitations in the Abdollahian et al. (2009) study. While there were equal numbers of participants in each diagnostic group, there were more male than female participants, so any gender differences may have been underrepresented in women and overrepresented men with schizophrenia. Participants consisted of those in an inpatient setting in Iran, so the results may not be generalizable to individuals with schizophrenia in an outpatient setting, untreated individuals with schizophrenia, or individuals in other geographic locations. The cross-sectional study design captured data at one point in time, so the study could not assess symptoms and behaviors in other points in time, which could have altered assessment and study results. The study only considered total positive symptoms, so it did not explore individual positive symptoms or their relationship with suicide (Abdollahian et al., 2009).

A strength of the Abdollahian et al. (2009) study was its large sample size (N =130), which strengthened the generalizability of the study results to most individuals with schizophrenia. A large sample size also increased the statistical power and ability to detect group differences, such as gender differences. The cross-sectional design was ideal for participants with whom follow-up might be difficult, such as those with severe mental illnesses like schizophrenia. The use of comparison groups minimized alternative explanations for suicide among the male and female schizophrenia groups. Using standardized assessment tools, such as the DSM-IV-TR (APA, 2000) criteria to diagnose schizophrenia, the PANSS (Kay et al., 1987) to assess the severity of positive and negative symptoms, and the Risk Estimator for Suicide (Motto et al., 1985) to assess suicide risk and history of attempts, increased the validity of the study results (Abdollahian et al., 2009).

In summary, Abdollahian et al. (2009) concluded that, even though both men and women with schizophrenia who experience positive symptoms are at risk for suicidal thoughts and

behaviors, women with schizophrenia may be at an even greater risk than men. Since there are known gender differences among individuals with schizophrenia, such as the higher risk for engaging in suicidal thoughts and behaviors for women who experience positive symptoms, it is important to explore the role positive symptoms play amid this population in order to reduce suicide and develop more preventative treatment measures (Abdollahian et al., 2009).

In the last study, Tang et al. (2007) examined 542 individuals with schizophrenia (244 female and 298 male) to explore gender differences. The researchers recruited participants from a psychiatric inpatient facility in Beijing, China (Tang et al., 2007). They gave participants a schizophrenia diagnosis using the DSM-IV (APA, 1994) and determined the subtypes using the ICD-10 (WHO, 1992). Study results indicated that 27% of women attempted suicide over one year as compared to 14% of men (x^2= (1, N =542) = 7.78, p = 0.008; Tang et al., 2007). The study classified about 51.6% of women and 40.6% of men as having the paranoid subtype of schizophrenia (Tang et al., 2007). Female participants (16.0 ± 6.7) yielded higher positive symptom scores on the PANSS (Kay et al., 1987) compared to male participants (14.2± 6.3; p = 0.011; Tang et al., 2007). Positive symptoms were significantly more prevalent at the onset of the illness among 77.9% of female versus 67.3% of male participants (p = 0.019; Tang et al., 2007). Approximately 55.1% of female participants experienced more positive symptoms over a longer period of time compared to 43.2% of male participants (p = 0.002; Tang et al., 2007). However, 23.6% of male participants initially experienced primarily positive symptoms, which shifted as negative symptoms became primary over time, as compared to 10.7% of female participants (p = 0.002; Tang et al., 2007). More male participants (34.9%) experienced severe deterioration over the course of their illness compared to 25.3% of female participants (p = 0.003; Tang et al., 2007).

This study had a few limitations. First, the study was cross-sectional, so exploring the etiology of suicide was more difficult, since behaviors and symptoms could be different in other time periods. There were slightly more male than female participants, so any issues or differences related to women with schizophrenia may have been skewed. Since the researchers recruited participants from Beijing, China, the results may not be generalizable to individuals with schizophrenia in other geographic areas. The study did not include first-episode patients among the participants, so the time between initial symptoms at the onset of schizophrenia and the participants' first treatment session may have produced different results. The sample consisted of participants who were receiving treatment, so the results may not be generalizable to untreated individuals with schizophrenia. The researchers collected data using death certificates, medical records, and corroborating family members or caregivers, so the results did not include personal explanations for suicide. Even though the researchers assessed the participants' schizophrenia symptoms and took the participants' attempt histories into account, the study did not explore the two variables together to determine a potential relationship. The study did assess symptom severity but did not consider its relationship to suicide (Tang et al., 2007).

A strength of the Tang et al. (2007) study was its large sample size, which increased the statistical power and generalizability of the study results. The researchers of the study controlled for external confounds through their exclusion criteria, such as head injuries, substance-induced disorders and other comorbid disorders, which could alter symptomatology and test results (Tang et al., 2007). The researchers used standardized assessment tools, such as the PANSS (Kay et al., 1987) and the BPRS (Overall & Gorham, 1962), to assess positive symptoms, which strengthened the validity of the study results. Two psychiatrists consulted the DSM-IV (APA, 1994) criteria for schizophrenia diagnoses, which increased diagnostic validity and reliability.

The study used collateral data, such as family member interviews and chart reviews, to corroborate clinical findings, which bolstered the validity of the results. However, to understand the gender differences in this study, readers must be fully aware of the cultural influences on gender and gender roles in China. Because this study is from a non-western culture, the gender roles or societal value of genders may not be the same as in western culture. Such cultural differences could influence perceptions about the social and economic value of each gender and how this perceived social value could influence the person's decision to attempt suicide. In summary, Tang et al. (2007) demonstrated differences between genders in suicidal individuals with schizophrenia, such as female participants experiencing more positive symptoms and male participants experiencing slightly more negative symptoms as well as male participants experiencing a worse course of illness compared to female participants.

Taken together, the studies suggested an association between suicide risk and positive symptoms, such as delusions or hallucinations, in both male and female individuals with schizophrenia. Positive symptoms, delusions rather than hallucinations, experienced earlier in schizophrenia (at 2-year interval) were associated with a greater risk for suicidal thoughts and behaviors among men with schizophrenia later in life (at 7.5-year interval) but not among women (Kaplan et al., 2012). Furthermore, all individuals with schizophrenia who present with more positive symptoms were increasingly likely to engage in suicidal thoughts and behaviors, with women at a slightly higher risk (Abdollahian et al., 2009; Tang et al., 2007). Only one study demonstrated women had more positive symptoms and more attempts, but the two factors were not explored together (Tang et al., 2007). Both men and women with schizophrenia who experienced negative symptoms were at a lower risk for suicidal thoughts and behaviors (Abdollahian et al., 2009). These factors further illustrate the differences in how the symptoms of

schizophrenia mitigate or exacerbate suicide risk across genders, raising questions about how biological and gender indicators relate to individual symptom experience.

Summary and Critique of Gender Studies

How does gender impact the relationship between positive symptoms and suicide in individuals with schizophrenia? There is limited research available on this subject, so it is necessary to begin with the broader topic of gender differences among individuals with schizophrenia and suicide before proceeding to positive symptoms. Some studies explain these gender differences from a sociodemographic (Atalay & Atalay, 2006; Chaves et al., 1993; Shtasel et al., 1992; Usall et al., 2001) or biological perspective (De Luca et al., 2010; Lewis et al., 1996; Nopoulos et al., 1997; Ray et al., 2019). Most of the literature in this chapter has been consistent in finding men with schizophrenia have an earlier onset of their illness, while women with schizophrenia have a later onset (Atalay & Atalay 2006; Chaves et al., 1993; Nopoulos et al., 1997; Usall et al., 2001). The research shows that men with schizophrenia have worse overall functioning, while women with schizophrenia demonstrate better overall functioning (Atalay & Atalay, 2006; Chaves et al., 1993; Shtasel et al., 1992; Tang et al., 2007; Usall et al., 2001).

The literature on suicide and schizophrenia has been similar to that of the general population, indicating men with schizophrenia are more likely to die by suicide (Atalay & Atalay 2006; Høye et al., 2011; Limosin et al., 2007), while women with schizophrenia are more likely to attempt suicide (Atalay & Atalay, 2006; Carlborg et al., 2010; Limosin et al., 2007; Tang et al., 2007). However, when delving deeper into the topic of gender, schizophrenia, and suicide, the literature becomes narrower. For instance, two U.S. studies suggested men with schizophrenia were at the highest risk for suicide deaths in the early stages of their illness compared to women with schizophrenia (Kaplan et al., 2012, 2016). Unlike other research,

which indicated more men with schizophrenia died by suicide (Høye et al., 2011; Kaplan et al., 2016; Limosin et al., 2007), two studies, one in Sweden and one in China, found that more women with schizophrenia died by suicide than men (Carlborg et al., 2010; Lyu & Zhang, 2014). However, these findings must be interpreted with caution due to the unequal number of male versus female participants in each study. In looking at the literature on gender, suicide, and positive symptoms, there were three studies, one in Turkey, one in China, and one in Spain, that found women with schizophrenia had more paranoid symptoms (Atalay & Atalay, 2006; Tang et al., 2007; Usall et al., 2001). There were two studies, one in the U.S. and one in China, that found men with schizophrenia had more negative symptoms compared to women with schizophrenia (Shtasel et al., 1992; Tang et al., 2007). Other studies on gender differences among individuals with schizophrenia that looked only at suicide (De Luca et al., 2010; Kaplan et al., 2012) or at positive symptoms and suicide variables (Abdollahian et al., 2009; Kaplan et al., 2012; Lewis et al., 1996; Tang et al., 2007) yielded findings that were exclusive to one study and have not yet been replicated.

All 16 gender studies had adequate to large sample sizes (Abdollahian et al., 2009; Atalay & Atalay, 2006; Carlborg et al., 2010; Chaves et al., 1993; De Luca et al., 2010; Høye et al., 2011; Kaplan et al., 2012, 2016; Lewis et al., 1996; Limosin et al., 2007; Lyu & Zhang, 2014; Nopoulos et al., 1997; Ray et al., 2019; Shtasel et al., 1992; Tang et al., 2007; Usall et al., 2001), which was important because the results yielded more statistical power to better determine group differences, such as those between genders. Larger sample sizes also reduced the margin of error, increased the accuracy of the study results, and increased external validity, which made the results more generalizable to more individuals with schizophrenia.

Several of the studies used a longitudinal/prospective design (Carlborg et al., 2010; Høye et al., 2011; Kaplan et al., 2012, 2016; Limosin et al., 2007; Ray et al., 2019) which allowed the researchers to follow symptoms over a long period of time and to identify associated risk factors, which will be helpful for future treatment planning. However, participants in a longitudinal study may be subject to external confounding variables, such as treatment, the passage of time, accessibility, or quality of care, which could reduce or increase symptoms or suicide rates and thus alter study results.

The studies that used a psychological autopsy design (Limosin et al., 2007; Lyu & Zhang, 2014; Tang et al., 2007) were able to minimize attrition of participants by using death certificates and medical records of deceased patients. In utilizing multiple sources of data, they were also able to corroborate their findings. However, a psychological autopsy design may not yield the most accurate data due to sampling biases and extraneous confounding variables, such as relying on friends and family members to diagnose or provide information about events leading up to a suicide death.

Most of the gender studies recruited participants from an inpatient setting (Abdollahian et al., 2009; Atalay & Atalay, 2006; Carlborg et al., 2010; Høye et al., 2011; Kaplan et al., 2012, 2016; Limosin et al., 2007; Nopoulos et al., 1997; Ray et al., 2019; Tang et al., 2007), which is ideal for researchers. Since individuals with schizophrenia are a vulnerable and protected population, studying them in a research setting may not always be possible. However, using patients in an inpatient setting can also prevent study findings from being generalizable to those in an outpatient setting, since inpatients' symptomatology may be more severe. There was only one gender study that utilized both inpatients and outpatients as participants (Limosin et al., 2007), which increased the validity of the study results and made them more generalizable to

most individuals with schizophrenia. The studies that recruited from research facilities (Lewis et al., 1996; Nopoulos et al., 1997; Shtasel et al., 1998) may have encountered sampling biases, since the participants most likely knew what the research study was about and what the researchers were looking for with regard to symptoms or diagnosis, which could skew study results. Only three studies (Abdollahian et al., 2009; Chaves et al., 1993; Usall et al., 2001) that were cross-sectional in design used random sampling, which eliminated sampling bias and increased the applicability of their findings to more individuals with schizophrenia. However, the cross-sectional design only captured a snapshot in time, so the findings could be different in other points in time.

Most of the gender studies (Abdollahian et al., 2009; Chaves et al., 1993; De Luca et al., 2010; Høye et al., 2011; Kaplan et al., 2012, 2016; Lewis et al., 1996; Limosin et al., 2007; Lyu & Zhang, 2014; Shtasel et al., 1992; Tang et al., 2007; Usall et al., 2001) over-represented male participants with schizophrenia, which is common in most research studies. However, unequal male and female participants can limit the generalizability of the results and applicability to clinical practice. There were only two studies (Atalay & Atalay, 2006; Nopoulos et al., 1997) that contained equal numbers of men and women participants with schizophrenia, so they were better able to assess gender differences, and their results were more generalizable to most individuals with schizophrenia.

Of the 16 gender studies, five of them were conducted in the U.S. (Kaplan et al., 2012, 2016; Lewis et al., 1996; Nopoulos et al., 1997; Shtasel et al., 1992), five were conducted in Europe (Atalay & Atalay, 2006; Carlborg et al., 2010; Høye et al., 2011; Limosin et al., 2007; Usall et al., 2001), four were conducted in Asia (Abdollahian et al., 2009; Lyu & Zhang, 2014; Ray et al., 2019; Tang et al., 2007), one was conducted in Canada (De Luca et al., 2010), and one

was conducted in South America (Chaves et al., 1993). There were a total of six studies that explored the variable of suicide without positive symptoms, one of which was in the U.S. (Kaplan et al., 2016), three of which were in Europe (Carlborg et al., 2010; Høye et al., 2011; Limosin et al., 2007), and two of which were in Asia (Lyu & Zhang, 2014; Tang et al., 2007). There were only two gender studies that explored both positive symptoms and suicide, one of which was in the U.S. (Kaplan et al., 2012) and one was in Asia (Abdollahian et al., 2009). Of these two studies, one looked at total positive symptoms and suicide (Abdollahian et al., 2009), so it did not consider the relationship between individual positive symptoms and suicide. Kaplan et al. (2012) only looked at delusions and hallucinations, rather than all individual positive symptoms, to explore a potential relationship to suicide.

One gap in the current literature on gender differences in positive symptoms among suicidal individuals with schizophrenia is the failure to include socioeconomic status as a study variable. Socioeconomic status could impact a person's ability to access mental health services (Aguilar-Gaxiola et al., 2012; Durà-Vilà & Hodes, 2012). The current literature on gender differences also lacks cultural explanations related to suicide, schizophrenia symptoms, views on mental health, and gender roles, all of which could influence a person's desire to engage in treatment-seeking behaviors, how a person might seek help or treatment, a person's suicidal thoughts and behaviors, and a person's presentation of symptomatology. For instance, in more patriarchal societies, especially those that view women as inferior, mental health disorders may be more prevalent in women, and the respective suicide rates are likely much higher. Also, men in patriarchal societies who suffer from disabilities related to mental illnesses, such as schizophrenia, may have higher suicide rates, which may stem from social expectations related to gender roles, such as being the head of household or breadwinner. More multicultural studies

on gender differences in suicidal individuals with schizophrenia who also experience positive symptoms are needed so that researchers can identify more specific risk factors and mental health professionals can implement more culturally competent treatment.

Only about one-third of all the gender studies in this chapter were conducted in the U.S. (Kaplan et al., 2012, 2016; Lewis et al., 1996; Nopoulos et al., 1997; Shtasel et al., 1992), and only one (Kaplan et al., 2012) of the two studies (Abdollahian et al., 2009; Kaplan et al., 2012) on positive symptoms and suicide was in the U.S. The U.S. is essentially behind the curve regarding schizophrenia research, since most studies tend to be from European (Atalay & Atalay, 2006; Carlborg et al., 2010; Høye et al., 2011; Limosin et al., 2007; Usall et al., 2001) or Asian (Abdollahian et al., 2009; Lyu & Zhang, 2014; Ray et al., 2019; Tang et al., 2007) countries. More specifically, the U.S. is lagging in research studies on positive symptoms and suicide among individuals with schizophrenia. Being able to determine which positive symptoms are related to suicide in this population could be groundbreaking for pharmacological and psychotherapy treatment regimens globally.

There is a need for studies with more equalized inpatients, outpatients, and untreated individuals with schizophrenia among study participants so that any gender differences discovered may more accurately represent the target population. There is also a need among the current literature on gender differences in suicidal individuals with schizophrenia for more randomly selected participants, which would decrease the influence of any biases from participants or researchers, making the data more valid and reliable. Not only is there a need for more gender equalization in research samples, but the current literature on gender differences among those with schizophrenia is also lacking inclusion of other gender groups, such as transgender, non-binary, or agender individuals, so that related results can be generalizable to

more individuals with schizophrenia and clinicians can tailor treatment accordingly. Given the fact that there are known binary gender differences related to the onset and course of schizophrenia, there could be differences in schizophrenia among individuals who identify as non-binary or other gender groups.

Of the four biological studies in the current review section, three explored positive symptoms (Lewis et al., 1996; Nopoulos et al., 1997; Ray et al., 2019), and only one of them (Lewis et al., 1996) explored positive symptoms with suicide. However, Lewis et al. (1996) were unable to find a correlation between total positive symptoms and suicide, which indicates a need for more biological studies on gender differences among suicidal individuals with schizophrenia who experience positive symptoms. Within the current review on gender differences, none of the literature explored treatment compliance, which could be different in men and women with schizophrenia, especially since there are known differences in both the frequency and duration of inpatient stays between men and women (Atalay & Atalay, 2006). Finally, there were no studies that explored the trauma variable and how it might relate to positive symptoms and suicide according to gender. There is some research that suggests a relationship between adverse childhood experiences and positive symptoms of schizophrenia (Üçok & Bıkmaz, 2007) and, more specifically, gender differences among individuals who experience childhood abuse and psychosis (Kelly et al., 2016), so more research in these areas is warranted.

CHAPTER III: THE IMPACT OF RACE AND ETHNICITY ON SUICIDE RISK IN INDIVIDUALS WITH SCHIZOPHRENIA

Ethnic minorities in the U.S., specifically Latinxs and African Americans, experience barriers to receiving proper mental health care, which in turn affects reported prevalence rates and treatment of mental illness within ethnic minority populations. For instance, Latinxs are currently the largest ethnic minority group in the U.S. at 18% of the population (U.S. Census Bureau, 2017), yet they are some of the most underrepresented individuals for receiving mental health care due to low socioeconomic status, immigration, and cultural factors (Aguilar-Gaxiola et al., 2012; Durà-Vilà & Hodes, 2012), which limit their access to care.

Mental health professionals should consider values and beliefs when diagnosing Latinx individuals in order to avoid over-pathologizing such things as lack of eye contact or passivity (Durà-Vilà & Hodes, 2012) or underreporting of suicidal thoughts and behaviors due to religious beliefs that may conflict with the desire to take one's own life (Barranco, 2016). Latinx clients tend to be expressive of physical and emotional pain, often through somatization, which mental health professionals can misunderstand as hypochondriasis or depression (Durà-Vilà & Hodes, 2012). Clinicians may misperceive as psychosis spiritual experiences involving visions or voices of a deceased loved one (Durà-Vilà & Hodes, 2012). The concept of *familismo*, a strong support system with a sense of honor and respect related to one's family, is important to consider, as Latinxs prefer to keep personal matters, including illnesses, within the family (Ayón et al., 2010). Because of these cultural differences, clinicians frequently diagnose Latinxs with mood disorders, specifically depression, even when psychotic symptoms are present (Minsky et al., 2003).

Studies show African Americans have been over-diagnosed with schizophrenia for decades (Barnes, 2004; Blow et al., 2004; Bresnahan et al., 2007; Choi et al., 2012) due to factors including clinician bias (Eack et al., 2012; Gara et al., 2012; Schwartz & Feisthamel, 2009; Trierweiler, 2006) and cultural paranoia (Whaley, 2001). In fact, several studies indicate that African Americans are diagnosed with schizophrenia 3-5 times as often as Whites or other minorities (Barnes, 2004; Blow, 2004; Breshnahan, 2007; Choi, 2012; Eack, 2012).

Cultural differences must be further researched in order to appropriately diagnose, treat, and increase help-seeking behaviors among ethnic minority groups. Without such research, implications such as side-effects of unnecessarily prescribed antipsychotic medications among African Americans and more severe psychopathology due to untreated psychosis among Latinxs will continue to be a concern.

Race and Ethnic Differences in Schizophrenia-Related Suicide Rates

According to the CDC (2019), the U.S. general population annual suicide rates for racial or ethnic groups are as follows: 83.6% for Caucasian/Whites, 6.0% for African-American/Blacks, 5.4% for Hispanic/Latinx, 2.8% for Asians, 1.8% for Native American/Alaskan Natives, and 0.3% for Other. Empirical research studies on suicidal individuals with schizophrenia are already quite scarce, but studies on suicidal individuals of different races and ethnicities who are also diagnosed with schizophrenia are even more limited. There were three studies in the U.S. that examined suicidal individuals with schizophrenia, two of which included results on Black, White, and Latinx participants (Fulginiti & Brekke, 2016; Karch et al., 2006) and one that only included Black and White participants (Kaplan & Harrow, 2018).

In a study funded by the National Institute of Mental Health (NIMH), Fulginiti and Brekke (2016) looked at 166 adult individuals with schizophrenia in the U.S. using a quasi-experimental, observational design over 36 months with 6-month follow-up periods. The researchers aimed to assess the outcomes of various community-based programs (Fulginiti & Brekke, 2016). The following was the racial group composition of the study sample: White (n =90 or 54% of total sample), Black (n =48 or 29% of total sample), and Latinx (n =28 or 17% of total sample). Comparison groups consisted of those who had a suicide attempt history and those who did not to determine their quality of life subjectively and objectively among work, living, social, and self domains (Fulginiti & Brekke, 2016). The researchers used the SADS (Endicott & Spitzer, 1978) to diagnose schizophrenia and assess suicide attempts and history (Fulginiti & Brekke, 2016). To assess quality of life, they utilized the Role of Functioning Scale (RFS; Goodman et al., 1993) and the Satisfaction with Life Scale (SWL; Diener et al., 1985). The researchers measured schizophrenia symptoms using the BPRS (Overall & Gorham, 1962). Results indicated that White individuals with schizophrenia had the highest suicide attempt rates (53.9%). Black individuals with schizophrenia had the second highest suicide attempt rates (30.3%). Latinx individuals with schizophrenia had the lowest suicide attempt rates (15.8%; Fulginiti & Brekke, 2016).

The study by Fulginiti and Brekke (2016) had some limitations. First, the inclusion criteria required the participants to be residents of Los Angeles, California, so the results may not be generalizable to other suicidal individuals with schizophrenia in other geographic areas. Next, the study was a cross-sectional design, so it was not possible to explore potential causes related to suicide, and the study was over a 36-month period, so it could not include participants in other time periods. The data collection presented another limitation; because participants were seeking

treatment in an outpatient setting, the results may not be generalizable to untreated or inpatient suicidal individuals with schizophrenia. There were more White participants, so the results may not generalize to the other racial groups. The study did not assess for positive symptoms or explore their relationship to suicide. Other than suicide, the study did not report any other variable results by race or ethnic group, so it also did not explore reasons for suicide within or between each racial group. The study did not consider socioeconomic status, which could have provided useful information related to suicide rates, especially within and between racial and ethnic groups. The researchers disclosed that their definition of suicide was broad because it included indirect, non-suicidal, self-harming behaviors, so the results may have overestimated the reported suicide rates. For example, on the SADS (Endicott & Spitzer, 1978), there is an item that asks if participant has ever tried to kill themselves or has done anything that could have resulted in dying. Finally, the study listed attrition rates as a limitation, but since none of the study variables correlated with the attrition rates, the authors suggested it did not affect the study results (Fulginiti & Brekke, 2016).

A strength of the Fulginiti and Brekke (2016) study was its large sample size (N =166), which increased the study's ability to detect any racial group differences, such as suicide attempts, and increased the validity of its findings. There was a two-step process for obtaining a schizophrenia diagnosis, which increased inter-rater reliability of the diagnoses among participants and increased validity of study results. The study excluded participants with other disorders, such as substance abuse or head injuries, which reduced or eliminated external confounding variables that may otherwise have interfered with study results. The researchers used standardized assessment and diagnostic tools, which increased the validity and reliability of study results (Fulginiti & Brekke, 2016). Finally, the researchers conducted face-to-face

interviews, so the data obtained from participants were more reliable and less likely to be biased or misinterpreted by using self-report measures. Overall, Fulginiti and Brekke (2016) were able to determine some differences in suicide attempts rates between racial groups.

A larger study by Karch et al. (2006) looked at 6,865 records of individuals of different races and ethnicities who died by suicide to assess their history of substance abuse and mental illness. The following is the racial group composition of the study sample without a specific diagnosis: White (n = 5797 or 84.4% of the sample), Black (n = 501 or 7.3% of the sample), Hispanic /Latinx (n = 257 or 3.7% of the sample), and other (non-Hispanic/Latinx; n = 310 or 4.5% of the sample). The researchers retrieved participant records for 2004 from the National Violent Data Reporting System, a database from 13 U.S. states. Schizophrenia and other mental illnesses were diagnosed using the ICD-10 (WHO, 1992).

Results indicated that Black participants had fewer attempted suicides before they died by suicide ($x^2 = (3, N = 6865) = 9.3$, $p = 0.03$), and they were more often diagnosed with schizophrenia ($x^2 = (3, N = 6865) = 15.4$, $p<0.01$) than other racial or other ethnic groups (Karch et al., 2006). The following was the reported history of suicide attempt rates by racial and ethnic groups (with no specified schizophrenia diagnosis) before death by suicide: 18.7% of White participants, 17.1% of other (non-Hispanic) participants, 16.7% of Hispanic/Latinx participants, and 13.4% of Black participants (Karch et al., 2006). The following were suicide deaths according to each racial and ethnic group with a schizophrenia diagnosis: 1.8% of White participants, 4.2% of Black participants, 1.2% of Hispanic/Latinx participants, and 2.6% of other (non-Hispanic) participants (Karch et al., 2006). Black participants without a schizophrenia diagnosis had the lowest suicide attempt rates compared to other racial groups, but they had the highest rate of suicide deaths when they were diagnosed with schizophrenia compared to other

racial groups (Karch et al., 2006). It is unclear whether schizophrenia symptoms or the stigma associated with a schizophrenia diagnosis contributed more to suicide deaths among African Americans (Karch et al., 2006).

The Karch et al. (2006) study had some limitations. First, the researchers collected data using deceased participants, which required the use of family interviews to identify suicide and mental illness symptomatology and severity. The lack of personal accounts could bias results. Also, since participants were deceased, the study could not explore trends in risk factors to possibly help the individuals prior to their deaths. Since the data in the national database were from 13 states in the U.S., the study's results may not generalize to individuals with schizophrenia or other mental illnesses in different states or to anyone outside of the U.S. The study included more White participants, which is not uncommon in research, but this decreased the generalizability of the study's results towards other racial groups. Since the researchers also explored substance use among participants through toxicology testing, they could not accurately determine when a participant died of a non-suicidal drug overdose or suicide (Karch et al., 2006). Further, more ethnic minorities received toxicology testing than Whites, so results were subject to researcher bias regarding drug use among certain minority groups. The authors also noted that human corpses will generate small amounts of alcohol as part of the decomposition process, which may have inflated the toxicology results (Karch et al., 2006). Another limitation was that the researchers did not look at participants' socioeconomic status, so they could not explore its impact on racial and ethnic group results. Finally, the study did not assess positive symptoms or explore their relationship with suicide and race or ethnicity (Karch et al., 2006).

A strength of the Karch et al. (2006) study was its the large sample size (N = 6,865), which increased the statistical power of the study and its ability to detect group differences, such

as race or ethnicity. The large sample size also improved the generalizability of the study's findings to more suicidal individuals with schizophrenia (Karch et al., 2006). The national database consisted of data from multiple sources, such as hospitals and law enforcement, which increased the quality of the participants and data (Karch et al., 2006). Since participants were deceased, participant attrition was eliminated, so the researchers were able to use the same participants throughout the study (Karch et al., 2006). The use of a standardized diagnostic tool, ICD-10 (WHO, 1992), increased the validity of the diagnoses and study results (Karch et al., 2006).

In summary, the Karch et al. (2006) study was able to determine that White participants had the highest suicide attempt rates with or without a schizophrenia diagnosis, which is consistent with the general population. Black individuals with schizophrenia had the second highest suicide attempt rates, but Black individuals without a schizophrenia diagnosis had the lowest rates of suicide attempts before death (Karch et al., 2006). Black individuals with schizophrenia had the highest rates of suicide deaths, while Latinx individuals with schizophrenia had the lowest rates of suicide-related deaths and attempts (Karch et al., 2006). Latinx participants without a schizophrenia diagnosis had the second lowest suicide attempts above Black individuals without a schizophrenia diagnosis (Karch et al., 2006).

Kaplan and Harrow (2018) conducted a 20-year longitudinal study on 400 inpatients from psychiatric facilities in Chicago as part of the Chicago Follow-Up Study (Westermeyer & Harrow, 1989), a larger longitudinal schizophrenia study. The Kaplan and Harrow (2018) study explored the relationship between suicidal individuals and social class among four diagnostic groups: schizophrenia (n = 119; 30% of the sample), schizoaffective (n = 59; 15% of the sample), other psychosis (n = 78; 20% of the sample), and major depressive disorder (n = 144;

36% of the sample). Racial groups for the entire sample were as follows: 12% (n = 47) were Black men, 13% (n = 52) were Black women, 35% (n = 139) were White men, and 41% (n = 162) were White women (Kaplan & Harrow, 2018). Racial groups for those with schizophrenia were as follows: 47% (n =22) were Black men, 25% (n =13) were Black women, 39.5% (n =55) were White men, and 18% (n =29) were White women (Kaplan & Harrow, 2018). To determine social class, the researchers assessed the participant's role in the household, highest level of education, and highest occupation attained (Kaplan & Harrow, 2018). The researchers diagnosed participants using the RDC (Spitzer et al., 1978), measured social class using the Social-Economic Status (Hollingshead & Redlich, 1958), and assessed suicidal activity (ideation and attempts) using SADS (Endicott & Spitzer, 1978). They determined suicide deaths using death registries, autopsy reports, or reports by a family member coupled with a more likely method for suicide, which was deemed as such by the researchers (Kaplan & Harrow, 2018).

Results indicated that White men with schizophrenia had the highest risk for suicide activity at 52.7% (Kaplan & Harrow, 2018). White women with schizophrenia had the second highest risk for suicide activity at 44.8% (Kaplan & Harrow, 2018). Black women with schizophrenia had the third highest risk for suicide activity at 38.5%, while Black men with schizophrenia had the lowest risk for suicide activity at 27.3% (Kaplan et al., 2018). Two statistically significant findings were that, among Black men with schizophrenia, suicide activity tended to decrease as they achieved a higher social status, as evidenced by 46% of Black men with low social status exhibiting suicidal activity over the study period ($p < .02$; Kaplan & Harrow, 2018). None of the high social status Black men exhibited suicidal activity (Kaplan & Harrow, 2018). The other significant finding was that 50% of White women with major depressive disorder and high social status exhibited suicidal activity, compared to 21% of

depressed women with low social status ($p < .01$; Kaplan & Harrow, 2018). The study did not find any other statistically significant differences for gender, race, or diagnostic groups that were related to suicidal activity and social status, but there were differences (Kaplan & Harrow, 2018).

The suicidal activity of White men and women with schizophrenia tended to increase as they achieved higher social status (Kaplan & Harrow, 2018). However, the suicidal activity of Black women with schizophrenia tended to increase as their social status became lower, much like their male counterparts (Kaplan & Harrow, 2018). Black men with schizophrenia tended to be more depressed and suicidal when they had lower social status, as evidenced by not being considered as the heads of their households, being less educated, and having lower level occupations (Kaplan & Harrow, 2018). However, as they achieved higher social status by being the heads of their households, gaining education, and holding higher level occupations, their depression and suicidal thoughts and behaviors tended to dissipate (Kaplan & Harrow, 2018). For White women with major depressive disorder, as they achieved higher social status, they became more depressed and suicidal (Kaplan & Harrow, 2018). These results could help with treatment planning for patients from different racial, gender, and diagnostic groups.

The Kaplan and Harrow (2018) study demonstrated some limitations. First, the sample consisted of individuals who received treatment in the Chicago area, so results may not be generalizable to untreated individuals with schizophrenia in other geographic locations. Next, the study measured suicide ideation, attempts, and deaths under the umbrella term, “suicide activity,” so it did not explore individual thoughts and behaviors (Kaplan & Harrow, 2018). There were more White participants than Black participants, so any findings related to Black participants may have been underrepresented. The longitudinal study design may have subjected participants to external confounding variables, such as the passage of time and other

environmental factors, which could have influenced study results. Finally, the study did not measure positive symptoms, so it did not determine their relationship to suicide among various racial and ethnic minority groups with schizophrenia (Kaplan & Harrow, 2018).

A strength of the Kaplan and Harrow (2018) study was its large overall sample (N = 400) as well as a large subsample of schizophrenia participants (n = 119), which increased the study's ability to detect group differences and increased its external validity. The results were thus more representative of most suicidal individuals with schizophrenia. The researchers used standardized assessment and diagnostic tools, which increased the reliability and validity of study results. Overall, the Kaplan and Harrow (2018) study was able to determine differences in suicide rates between racial groups with schizophrenia. They also found that rising social status mitigates suicide risk among Black men with schizophrenia and among White women with depression when they have lower social status (Kaplan & Harrow, 2018).

The first two studies (Fulginiti & Brekke, 2016; Karch et al., 2006) yielded similar results regarding suicide attempts before death, with White participants having the highest attempt rates compared to other racial groups. However, when the data reflected a schizophrenia diagnosis, African American participants had the highest number of suicide deaths (Karch et al., 2006). When the data did not include a schizophrenia diagnosis and looked instead at all African American participants, African Americans yielded the lowest number of suicide attempts before death (Karch et al., 2006). Results for Latinx participants remained the same for suicide deaths and attempts with or without a schizophrenia diagnosis in the Karch et al. (2006) study, but attempt rates for Latinx participants in the Fulginiti and Brekke (2016) study were the lowest. The third study (Kaplan & Harrow, 2018) yielded different results, with African American individuals with schizophrenia having lower rates of suicide than White participants with

schizophrenia. However, the study considered social class, Black men with schizophrenia who also had high social status had no suicide risk compared to those with low social status or White men with schizophrenia who had either social status. There are obvious differences in suicide rates between racial and ethnic groups, both with and without a schizophrenia diagnosis, or when looking at social class, so further studies that explore the added role of positive symptoms among these groups will be crucial.

The Effects of Positive Symptoms on Suicidal Individuals with Schizophrenia of Different Races and Ethnicities

Differences in suicide rates among various racial and ethnic groups have been found within the U.S. general population (CDC, 2019). However, the addition of a mental health disorder among different racial and ethnic groups can increase their suicide risk. Being able to have a more thorough understanding of mental health symptoms through a cultural lens is imperative to provide such individuals with more culturally competent care and avoid misdiagnosing them. Literature on this topic was scarce, but two studies (one on Asian participants and one on U.K. participants) looked at positive symptoms among individuals with schizophrenia, one of which assessed self-harm (Lee et al., 2004), while the other explored suicide deaths (Bhui & McKenzie, 2008).

A retrospective study by Lee et al. (2004) looked at 100 Asian participants with schizophrenia from four sub-culture groups (Chinese, Malaysian, Indian, and others) to determine the frequency of command hallucinations and to explore compliance and coping techniques. The researchers recruited inpatient participants from a large psychiatric facility in China (Lee et al., 2004). They used the DSM-IV (APA, 1994) for diagnostic purposes and employed a semi-structured interview to collect clinical data but did not provide the name of the

assessment tool in the study. The study defined self-harm as any behavior that resulted in harm or physical injury to oneself, including overdoses (Lee et al., 2004).

Results indicated that 53% of the entire sample reported command hallucinations (Lee et al., 2004). Sixty-two percent of those who reported command hallucinations also reported complying with commands, and previously reported self-harm was a predictor for compliance with command hallucinations (Lee et al., 2004). The study reported command hallucinations by sub-culture group: 70% of the sample were Chinese, 21% were Malaysian, 7.5% were Indian, and 1.9% were others (Lee et al., 2004).

The Lee et al. (2004) study had some limitations. First, the data were from participants in Singapore who were in psychiatric hospitals, so results may not be generalizable to untreated or outpatient individuals with schizophrenia in other geographic areas (Lee et al., 2004). The study design was retrospective, so participant responses were prone to recall bias, which could alter study results. The operationalized definition of self-harm was unclear, as it also included physical injuries and overdose, which are usually suicide attempt constructs. Furthermore, the study did not report self-harm by sub-culture. The study did not assess suicide or its relationship to command hallucinations or ethnic groups. The study also did not assess other positive symptoms, such as delusions, disorganized thoughts or disorganized behaviors. Although the study presented percentages for each sub-culture in a table format, it did not explore differences in command hallucinations by sub-culture group with other variables. The study did not equalize the number of subculture group participants, so it did not include any racial group differences, such as among White or Black participants. Results thus may not be generalizable to other racial groups. The study did not consider socioeconomic status was not assessed or its relationship to schizophrenia symptoms and self-harm. The study also did not explore cultural explanations for

command hallucinations or self-harm, so their relationship remains unknown. Lastly, the study did not examine compliance with command hallucinations with other risk factors that could increase self-harm (Lee et al., 2004).

A strength of the Lee et al. (2004) study was its large sample size (N = 100), which increased the study's ability to detect group differences, such as race or ethnicity. The researchers in the Lee et al. (2004) study used a standardized diagnostic tool, which enhanced the validity of the study results. Overall, Lee et al. (2004) determined self-harm was a predictor for compliance with command hallucinations, though they did not explore this finding within each sub-culture group.

Bhui and McKenzie (2008) examined 8,029 records of suicide deaths in the U.K. between 1996 and 2001 among different ethnic groups with various mental health disorders, including schizophrenia. The researchers used participant records from the National Confidential Inquiry into Suicide and Safety in Mental Health project database, which also recorded participants' contacts with mental health providers over the previous 12 months before their deaths (Bhui & McKenzie, 2008). Suicide deaths had been determined by a coroner (Bhui & McKenzie, 2008). The following are numbers and percentages of each racial/ethnic group for the entire sample (N = 8,029), excluding a schizophrenia diagnosis: Black African (n = 68 or .85% of sample), Black Caribbean (n = 97 or 1.21% of sample), South Asian (n = 166 or 2.07% of sample), and White (n = 7,698 or 95.88% of sample). Relevant results revealed suicide deaths for the following racial or ethnic groups with a primary schizophrenia diagnosis: 60% of Black African participants, 66% of Black Caribbean participants, 36% of South Asian participants (Indian, Pakistani, and Bangladeshi), and 12% of White participants (p = .001; Bhui & McKenzie, 2008). The study reported delusions and hallucinations, as recorded by clinicians,

within the last year of a participant's last contact with a mental health professional in two different ways (Bhui & McKenzie, 2008). The first set of data reported for each racial or ethnic group was via percentages of hallucinations and delusions: 19% of Black Caribbean participants, 14% of Black African participants, 12% of South Asian participants, and 3% of White participants ($p < .001$). The second set of data was only on the ethnic groups (excluding Whites) and reported hallucinations and delusions via odds ratio (OR): Black African (OR = 4.83, 95% CI 2.36-9.88, $p < .001$); Black Caribbean (OR = 3.11, 95% CI 1.18-8.20, $p = .02$); and South Asian (OR = 2.97, 95% CI 1.56-5.64, $p = .001$; Bhui & McKenzie, 2008).

Bhui and McKenzie (2008) had some limitations. First, participants were deceased, so the study did not explore personal accounts related to suicide and had to use more collateral data instead. Also, because it used deceased participants, the study could not identify trends in risk factors in an attempt to help participants before they took their own lives. Next, participants consisted of individuals who received treatment in the United Kingdom, so results may not be generalizable to untreated individuals with schizophrenia in other geographic locations. There was a large disparity between the number of White participants and Black and Asian participants in the study, so the actual number of schizophrenia participants who died by suicide was quite small, despite the higher rates within each racial or ethnic group. Since this study overrepresented White participants, the results may not be representative of other racial groups. Even though the study measured delusions and hallucinations, neither dataset included a schizophrenia diagnosis for each racial or ethnic group who experienced hallucinations and delusions, so it is unclear how many participants with schizophrenia experienced these symptoms. The study did not assess positive symptoms other than delusions and hallucinations or their relationship to suicide and the different racial and ethnic groups. How the researchers

determined a schizophrenia diagnosis was not clear other than noting the last clinician to see the participant before death provided information regarding the suicide, which could affect a participant's inclusion into the study (Bhui & McKenzie, 2008). The study did not assess either cultural explanations or socioeconomic status, which could further explain suicide rates for each racial and ethnic group (Bhui & McKenzie, 2008).

A strength of the Bhui and McKenzie (2008) study was its large sample size (N = 8,029), which increased the study's ability to detect group differences, such as those between racial and ethnic groups. The large sample size also increased the generalizability of its results to more suicidal individuals with schizophrenia. Using participants who were deceased eliminated attrition, which otherwise could have impacted study results. Higher rates or percentages of Black participants with schizophrenia died by suicide, compared to other racial or ethnic groups (Bhui & McKenzie, 2008), which is consistent with some literature (Karch et al., 2006).

In summary, Bhui and McKenzie (2008) was able to determine higher rates of Black Africans and Black Caribbeans with schizophrenia died by suicide. They found the lowest rates in South Asians, followed by Whites. The study indicated Black Africans and Black Caribbeans (with no schizophrenia diagnosis specified) had higher rates of hallucinations and delusions, while South Asians (with no schizophrenia diagnosis specified) had the lowest rates of hallucinations and delusions (Bhui & McKenzie, 2008). The differences in positive symptoms, such as delusions and hallucinations, according to race or ethnic group further elucidates the need for more research in order to reduce suicide risk among individuals with schizophrenia (Bhui & McKenzie, 2008).

There were a total of only two studies (Bhui & McKenzie, 2008; Lee et al., 2004) on racial and ethnic group differences among suicidal individuals with schizophrenia who

experienced positive symptoms. One study was from China (Lee et al., 2004), and one was from the U.K. (Bhui & McKenzie, 2008), so the racial and ethnic groups were very different in each, and their findings were unrelated. The Lee et al. (2004) study on Asian subcultures found self-harm rather than suicide as a predictor for one's compliance with command hallucinations. However, other than the percentage each subculture group experienced command hallucinations, it is unknown how self-harm and command hallucinations were related to each subculture group or why one group may experience more command hallucinations and self-harm than the others (Lee et al., 2004). The Lee et al. (2004) study also did not include other races, such as Black or Latinx. The second study (Bhui & McKenzie, 2008), which looked at different racial groups within the U.K., explored more relevant variables to this literature review, such as suicide deaths, schizophrenia diagnoses, and positive symptoms, such as delusions and hallucinations. Even though more White participants were in this study, higher rates of Black participants with a schizophrenia diagnosis died by suicide, and Black participants without a schizophrenia diagnosis experienced more delusions and hallucinations before death (Bhui & McKenzie, 2008). Both studies (Bhui & McKenzie, 2008; Lee et al., 2004) were able to yield some racial and ethnic group differences among individuals with schizophrenia, but the amount of relevant literature on the current topic is limited, which further illustrates the need for more research in this area.

Summary and Critique of Race and Ethnicity Studies

How do race and ethnicity impact the relationship between positive symptoms and suicide in individuals with schizophrenia? This section includes an overview of the study characteristics, followed by overarching trends, and concludes with a more in-depth analysis regarding the quality of the extant literature on suicidal individuals with schizophrenia both with

and without positive symptoms according to race and ethnicity. Further studies are necessary in order to illuminate the gaps in this body of research. There were only five studies (Bhui & McKenzie 2008; Fulginiti & Brekke, 2016; Kaplan & Harrow, 2018; Karch et al., 2006; Lee et al., 2004) on race and ethnicity among suicidal individuals with schizophrenia. The first three studies (Fulginiti & Brekke, 2016; Karch et al., 2006; Kaplan & Harrow, 2018), which explored racial and ethnic group differences among suicidal individuals without the positive symptom variable, were all conducted in the U.S. The Fulginiti and Brekke (2016) and the Kaplan and Harrow (2018) studies were the only two amongst the five total studies that were published in the past 10 years. The last two studies (Bhui & McKenzie, 2008; Lee et al., 2004) were the only studies that explored racial and ethnic group differences with the positive symptom variable. The Lee et al. (2004) study looked at self-harm rather than suicide and was conducted in China. The Bhui and McKenzie (2008) study was conducted in the U.K. They were the oldest studies among the five (Bhui & McKenzie., 2008; Lee et al., 2004).

All five of the studies in this chapter (Bhui & McKenzie, 2008; Fulginiti & Brekke, 2016; Kaplan & Harrow, 2018; Karch et al., 2006; Lee et al., 2004) had adequate to large sample sizes. Three studies used a longitudinal design (Bhui & McKenzie, 2008; Fulginiti & Brekke, 2016; Kaplan & Harrow, 2018), one of which utilized an outpatient sample (Fulginiti & Brekke, 2016), and one of which utilized an inpatient sample (Kaplan & Harrow, 2018). Two of the largest studies utilized records of deceased patients from large national databases (Bhui & McKenzie, 2008; Karch et al. 2006). The smallest study was a retrospective design that used an inpatient sample (Lee et al., 2004). Four of the five studies (Bhui & McKenzie, 2008; Fulginiti & Brekke, 2016; Kaplan & Harrow, 2018; Karch et al., 2006) explored differences among racial groups

(i.e., Black, White, or Latinx), and only one study explored differences among ethnic subculture groups (i.e., Chinese, Malay, Indian; Lee et al., 2004).

The literature on racial and ethnic group differences among individuals with schizophrenia and suicide is scarce and the results vary according to each study. In some cases, study results vary according to the country in which the study took place. Most studies that looked at different racial groups versus ethnic groups were conducted in either the U.S. or the U.K. Two U.S. studies found White individuals with schizophrenia had the highest number of suicide attempts (Fulginiti & Brekke, 2016) and the highest suicide activity rates (thoughts and behaviors; Kaplan & Harrow, 2018). However, another U.S. study found White individuals with schizophrenia had the second lowest suicidal death rates (Karch et al., 2006). Meanwhile, the Bhui and McKenzie (2008) study in the U.K. showed White individuals with schizophrenia had the lowest suicidal death rates.

One U.S. (Karch et al., 2006) and one U.K. (Bhui & McKenzie, 2008) study found Black individuals with schizophrenia died by suicide at higher rates compared to other racial groups. However, all three U.S. studies (Fulginiti & Brekke, 2016; Kaplan & Harrow, 2018; Karch et al., 2006) found the following, respectively: Black individuals with schizophrenia had the second highest suicide attempt rates (Fulginiti & Brekke, 2016), the lowest suicide attempt rates (Karch et al., 2006), and the lowest rates of suicide activity (thoughts and behaviors; Kaplan & Harrow, 2018), compared to other racial groups. Two U.S. studies found Latinx individuals with schizophrenia had the lowest suicide attempt rates (Fulginiti & Brekke, 2016; Karch et al., 2006), one of which also reported Latinx individuals with schizophrenia had the lowest suicidal death rates (Karch et al., 2006), as compared to other racial groups.

The literature on racial and ethnic group differences among individuals with schizophrenia and suicide is minimal, and literature on the added positive symptom variable is even more uncommon. The results are inconsistent and vary according to each study, and in some cases, study results vary according to the country where the research was conducted. Most studies that looked at different racial groups rather than ethnic groups took place in either the U.S. or the U.K. There were only two studies which also looked at the positive symptom variable, one of which was in China and assessed differences among and between ethnic groups (Lee et al., 2004), and one which was in the U.K. and assessed differences among and between racial groups (Bhui & McKenzie, 2008).

Only two of the five studies reviewed in this chapter suggested that factors, such as social status, which influence suicide rates, differed among and between racial groups (Kaplan & Harrow, 2018) or having a schizophrenia diagnosis (Karch et al., 2006). Even though there were more White men with schizophrenia in both studies (Kaplan & Harrow, 2018; Karch et al., 2006), higher rates of Black participants were diagnosed with schizophrenia and either died by suicide (Karch et al. 2006) or experienced some level of suicidal activity (Kaplan & Harrow, 2018), which suggested differences between and within racial groups. The Kaplan and Harrow (2018) study found that, as Black men with schizophrenia rise in social status, their suicide rates decrease but found the opposite among White men with schizophrenia. These findings suggested differences in factors that impact suicide risk between racial groups (Kaplan & Harrow, 2018). Kaplan and Harrow (2018) was the only study that explored the socioeconomic variable. Socioeconomic status can affect a person's ability to access mental health care or the quality of care (Aguilar-Gaxiola et al., 2012; Durà-Vilà & Hodes, 2012), which can in turn lead to an exacerbation of untreated symptoms, including suicidal thoughts and behaviors. Neither study

looked at positive symptoms (Kaplan & Harrow, 2018; Karch et al., 2006), so it is unknown how they relate to suicidal individuals with schizophrenia in different racial groups. The Karch et al. (2006) study found, when African American participants had a schizophrenia diagnosis, they had the highest suicide death rates, but, when they did not have a schizophrenia diagnosis, they had the lowest suicide attempt rates. Karch et al. (2006) further showed that White participants who had a schizophrenia diagnosis had one of the lowest suicide death rates, but White participants who did not have a schizophrenia diagnosis had the highest suicide attempt rates. The Karch et al. (2006) findings also suggest differences in factors that impact suicide risk within and between racial groups.

With regard to the two positive symptom studies (Bhui & McKenzie, 2008; Lee et al., 2004), Lee et al. (2004) found more Chinese individuals with schizophrenia experienced command hallucinations than the other groups, followed by Malaysian individuals, Indian individuals, and Others. These findings indicated differences in symptomatology between ethnic groups. The Lee et al. (2004) study explored self-harm rather than suicide, so its findings do not elucidate the relationship between suicide and command hallucinations. The study also did not explore rates of self-harm by subculture group, nor did it consider the rates of self-harm and command hallucinations together to determine a potential relationship (Lee et al., 2004). The study did not include other racial groups, such as Black or Latinx, among its participants (Lee et al., 2004).

Bhui and McKenzie (2008) found Black African and Black Caribbean participants had higher rates of hallucinations and delusions, while South Asians had the lowest rates of hallucinations and delusions, which also indicated differences in symptomatology between racial groups. However, the study did not report symptoms within each diagnostic group, so it is

unclear how many Black or South Asian participants with schizophrenia experienced hallucinations and delusions compared to Black or South Asian participants with bipolar disorder or other mental disorders (Bhui & McKenzie, 2008).

There is a lack of literature on differences in positive symptoms and suicide among individuals with schizophrenia from various racial and ethnic groups. More specifically, there is a lack of recent studies on this topic. Only two of the five studies in the current review were conducted or published within the past 10 years (Fulginiti et al., 2016; Kaplan & Harrow, 2018), so the existing data on this topic are rather dated. Many global events, both political (e.g., changes in leadership, harsh immigration policies and restrictions) and social (e.g., increases in ethnic minority group member killings, recent pandemic developments and consequences) in nature, have occurred over the past 10 years, which could impact the mental health needs of among racial and ethnic groups with and without a schizophrenia diagnosis. To address these shifts, there is a need for more current research in this area.

Moreover, cultural influences, such as religion, can impact suicidal thoughts and behaviors (Barranco, 2016), and clinicians may misconstrue cultural beliefs and behaviors as symptoms of mental illness (Durà-Vilà & Hodes, 2012), so more research in these areas is essential to avoid underdiagnosing or over-pathologizing particular populations. More longitudinal studies that start when individuals are initially diagnosed with schizophrenia and follow them for several years while they receive culturally competent care would serve to initiate and assess the efficacy of early treatment among underserved populations and more thoroughly identify risk factors. Research on the efficacy of culturally affirming treatment methods, such as providing psychoeducation in a patient's native language (written and via an interpreter) or incorporating a religious or spiritual leader into individual or family therapy sessions, could help

White or non-minority clinicians better serve ethnic minority patients. More studies are also needed in larger countries, such as the U.S., Asia, and Europe, where more individuals with schizophrenia from different racial and ethnic minority backgrounds are available to participate in research. Larger and more racially and ethnically diverse population samples would help to equalize study group participants and increase the external validity of study findings.

The current review lacks racial and ethnic group studies with more equalized inpatient, outpatient, and untreated living participants with schizophrenia so that mental health professionals can incorporate more preventative efforts related to suicide and more culturally-tailored treatments across treatment settings. It is apparent due to the lack of literature in the current section that more research studies in these areas are needed, not only to identify more risk factors related to suicide among various racial and ethnic groups, but to also more thoroughly understand underlying cultural factors that may influence symptom severity or presentation, views on mental illness and treatment, and access to care. Expanding this body of research will enable practitioners to provide more culturally competent care for minority populations.

CHAPTER IV: THE IMPACT OF PREMORBID IQ ON SUICIDE RISK IN INDIVIDUALS WITH SCHIZOPHRENIA

One of the main features of schizophrenia is a decline in cognition (APA, 2013), but the exact relationship between schizophrenia and cognitive functioning, specifically intelligence quotient (IQ), remains unclear. A 2005 longitudinal study by Reichenberg et al. (2005) showed that a lower actual IQ of participants at the age of 17 was a risk factor for developing schizophrenia later in life. Another longitudinal study by Zammit et al. (2004) found that a lower premorbid IQ was a risk factor for developing schizophrenia, other psychotic disorders, and depression.

Aside from IQ being a risk factor for the onset of schizophrenia, there is more literature related to cognitive deficits among individuals with schizophrenia. Tang et al. (2019) found that participants who had deficit (or negative symptom) schizophrenia performed worse than the non-deficit schizophrenia or the healthy control groups on all cognitive testing. They also found that the non-deficit schizophrenia group performed worse on all cognitive testing, except the attention and processing speed tasks, compared to the healthy control group (Tang et al., 2019). Han et al. (2012) and Mak et al. (2019) observed that participants with schizophrenia performed worse on executive functioning tasks as compared to the healthy control groups. Studies have also explored other biological explanations for decreased cognitive functioning among individuals with schizophrenia. Ohoshi et al. (2019) discovered that brain structural abnormalities were associated with poor performance in executive functioning tasks among individuals with schizophrenia compared to healthy controls. The Xiu et al. (2019) study indicated that schizophrenia participants had reduced brain serum levels as compared to a control

group. Low brain serum levels were associated with poor executive functioning tasks among individuals with schizophrenia compared to control groups (Xiu et al., 2019).

However, there is limited literature that relates to suicide and its association with cognitive functioning and positive symptoms among individuals with schizophrenia. Kocatürk et al. (2015) found that participants with a history of suicide attempts reported higher rates of positive, negative, and depression symptoms and performed worse on executive functioning tasks. There are clinical (Tang et al., 2019) and biological (Ohoshi et al., 2019; Xiu et al., 2019) reasons for changes in cognitive functioning among individuals with schizophrenia, which could impact the course of the illness, including an exacerbation of symptoms and suicidal thoughts and behaviors. In order to mitigate premature deaths among this vulnerable population, it is critical to explore the relationship between premorbid IQ and suicidal individuals with schizophrenia.

Premorbid IQ in Suicidal Individuals with Schizophrenia

Among the general population, a high IQ is a protective factor for suicide (hazard ratio per standard deviation decrease in IQ=1.57, 95% confidence interval 1.54 to 1.60; Batty et al., 2010). However, among the population with schizophrenia, the literature has been mixed with regard to premorbid IQ as a risk for suicide. Three studies addressed this topic, but none of them assessed positive symptoms (Barrett et al., 2011; Webb et al., 2011; Weiser et al., 2015).

The first study by Webb et al. (2011) looked at 13,804 Swedish individuals with schizophrenia admitted to psychiatric hospitals between 1973 and 2004 to examine the relationship between violence, intelligence, and suicide among this population. Results indicated high IQs among male participants were associated with higher suicide risk (7.3 per 1000 person-years) compared to male participants with average or medium IQs (6.6 per 1000), but the

difference was non-significant (chi^2 0.6, 1 df, *P*=0.44; Webb et al., 2011). The study found low IQ was a protective factor against suicide for male participants (rate ratio 0.71, 0.58–0.86) compared to male participants with average or high IQs (Webb et al., 2011).

The Webb et al. (2011) study had some limitations. First, even though the sample size was large, it consisted only of individuals receiving treatment in Sweden, so results may not be generalizable to untreated individuals with schizophrenia in other geographic locations or those without a criminal history of violent offenses. Next, over the 32-year study period, the researchers used multiple diagnostic classification systems, which could alter inclusion of participants in the study. Study authors also indicated the number of IQ ratings missing among the male participants and the lack of IQ ratings taken from women could impact the study results significantly (Webb et al., 2011). It is unclear how the researchers assessed IQs, since the study only mentioned how they performed calculations for the Military Service Conscript Register, one of only five national registers used, which could skew study results. Further, the study required that participants be admitted to a psychiatric facility at least two times previously, so this may have excluded many eligible participants who had only been admitted once to a psychiatric hospital. The data included unnatural deaths with undetermined causes, which could inflate suicide rates. The study did not assess premorbid IQ specifically, but rather what authors referred to as "Global IQ," or its relationship to positive symptoms and suicide (Webb et al., 2011). Finally, this study did not assess positive symptoms or consider their relationship to suicide and IQ (Webb et al., 2011).

A strength of the Webb et al. (2011) study included its large sample (N = 13,804), which increased its statistical power, the study's ability to detect any group differences, as well as the validity of the study's results. Another strength is the prospective cohort design, which offered

the ability to observe trends and risk factors among a larger number of individuals (N = 13,804) over a 32-year period. The researchers diagnosed schizophrenia and classified suicide deaths using standardized classification systems, such as the International Classification of Diseases: ICD-8 (WHO, 1965), ICD-9 (WHO, 1978), and ICD-10 (WHO, 1992). The study drew upon multiple data sources, including cause of death, military, hospital discharge, crime, and migration registers, which improved the quality of the study's data and increased generalizability of the results to more individuals with schizophrenia. In summary, Webb et al. (2011) were able to determine that a high IQ was a risk factor for suicide in men with schizophrenia, and a low IQ was a protective factor for suicide in men with schizophrenia.

Another study by Barrett et al. (2011) studied 174 individuals with schizophrenia to assess IQ, executive function skills, and impulsivity among those with previous suicide attempts. The researchers recruited participants from a large psychosis translational study database, which consisted of both inpatients and outpatients from psychiatric facilities in Norway (Barrett et al., 2011). Results indicated no significant differences between attempters and non-attempters regarding IQ, executive functioning, or impulsivity (Barrett et al., 2011). The study explored the positive symptoms subscale on the PANSS (Kay et al., 1987) with attempters and non-attempters but found no statistically significant differences (Barrett et al., 2011). The study also examined premorbid IQ with attempters and non-attempters but yielded no statistically significant differences (Barrett et al., 2011).

The Barrett et al. (2011) study had some limitations. First, the sample only consisted of participants from Norway in one of three local psychiatric facilities, so results may not be generalizable to untreated individuals with schizophrenia in other geographic locations. Next, because the study focused more on neurocognitive functioning and suicide rather than positive

symptoms and suicide, it did not assess individual positive symptoms or explore for a potential relationship with suicide and premorbid IQ. Lastly, the study combined schizophrenia and schizophreniform disorders, so it did not isolate positive symptom and IQ variables for individuals with schizophrenia (Barrett et al., 2011).

A strength of the Barrett et al. (2011) study was its large sample size, which increased the reliability of the study's results, its ability to detect any group differences, and the generalizability of its findings to more individuals with schizophrenia. Other strengths are the standardized assessments used, such as the PANSS (Kay et al., 1987), the National Adult Reading Test (NART; Nelson & Willison, 1991), and diagnostic classification systems such as the DSM-IV (APA, 1994). In summary, the Barrett et al. (2011) study did not yield any statistically significant correlations between positive symptoms, IQ, and suicide among individuals with schizophrenia.

The last study by Weiser et al. (2015) examined records of 5,893 Israeli adolescent male individuals with schizophrenia, 77 of whom died by suicide, to explore the relationship between premorbid IQ and suicide among this population. The study compared participants with schizophrenia to a group of healthy controls (n = 566,276). The researchers recruited participants from military, hospitalization, and death registries in Israel and followed them over a 22-year period (Weiser et al., 2015). The follow-up period for suicide was 9.9 years ± 5.8 years (Weiser et al., 2015). The researchers classified schizophrenia diagnoses and suicide deaths using the ICD-9 (WHO, 1978) and ICD-10 (WHO, 1992).

Study results indicated participants with schizophrenia with a high premorbid IQ were at a significantly higher risk for suicide deaths compared to those with an average premorbid IQ (HR = 4.45; 95% CI = 1.37-14.43), and these deaths occurred within a 12-month period

following a psychiatric hospitalization (Weiser et al., 2015). There was also an elevated risk for suicide among participants with schizophrenia with a low premorbid IQ, but the differences compared to those with an average premorbid IQ were not statistically significant (HR = 1.81, 95% CI = 0.75-4.34; Weiser et al., 2015). Participants with a low premorbid IQ from the healthy control group were at an increased risk for suicide (HR = 1.35, 95% CI = 1.02-1.77), when compared to those with an average premorbid IQ (Weiser et al., 2015). The study found no significant increased risk among participants from the healthy control group with a high premorbid IQ (Weiser et al., 2015).

There were limitations in the Weiser et al. (2015) study. First, the sub-sample groups were large, but there were significantly more healthy controls than participants with schizophrenia, so any differences may not be representative of most individuals with schizophrenia. The study results may not generalize to individuals with schizophrenia in geographic areas other than Israel. The study did not contain female participants, so the results may not be generalizable to female individuals with schizophrenia. The study excluded participants from smaller areas of the country, so the results may not be generalizable to individuals with schizophrenia in more rural geographic locations. Also, this study did not assess for positive symptoms or explore their relationship to suicide and premorbid IQ (Weiser et al., 2015).

A strength of the Weiser et al. (2015) study was its adequate sample size (n = 77), which increased its external validity, making the sample more representative of most individuals with schizophrenia. The adequate sample size also increased the study's statistical power and its ability to detect group differences. Another strength of the Weiser et al. (2015) study was that it used standardized assessment and diagnostic tools, which increased the reliability and validity of

the results. In order to reduce external confounding variables, the researchers excluded participants for the following reasons: participants who died due to any reasons other than suicide, participants who exhibited psychotic symptoms during the assessment phase or were admitted to a psychiatric facility within 12 months of the assessment phase, and participants whose assessment data were missing (Weiser et al., 2015). The researchers explored socioeconomic status (SES) among participants, which other studies found to be related to cognitive and intellectual functioning (Hart et al., 2007; Rindermann et al., 2010), and were able to control for SES by excluding participants without this data (Weiser et al., 2015).

In summary, Weiser et al. (2015) were able to determine that men with schizophrenia and a high premorbid IQ were at a higher risk for suicide, while men from the healthy control group and a low premorbid IQ were at a higher risk for suicide. The literature on premorbid IQ as a risk factor for suicide among individuals with schizophrenia is scarce, and even though two of the three studies yielded results (Webb et al., 2011; Weiser et al., 2015), the other one reported no differences between suicide attempters and non-attempters regarding premorbid IQ (Barrett, et al., 2011).

There were only three studies that explored intelligence quotient (IQ) and suicide among individuals with schizophrenia without the positive symptom variable (Barrett et al., 2011; Webb et al., 2011; Weiser et al., 2015), all of which were published in the last 10 years. None of the studies were conducted or published in the U.S., but two were European studies (Barrett et al., 2011; Webb et al., 2011), and one study was Israeli (Weiser et al., 2015). Two of the studies were large, longitudinal, population-based studies (Webb et al., 2011; Weiser et al., 2015), and the third study was a psychosis research study that consisted of both inpatients and outpatients with schizophrenia (Barrett et al., 2011). Only two of the studies yielded significant findings

(Webb et al., 2011; Weiser et al., 2015). Both the Webb et al. (2011) and the Weiser et al. (2015) studies also had similar results, such as finding that a high IQ was a risk factor among men with schizophrenia. However, Webb et al. (2011) further indicated that a low IQ was a protective factor for suicide among men with schizophrenia, while the Weiser et al. (2015) study indicated that a low IQ was a risk factor for suicide among healthy participants. The fact that findings were only replicated in two studies, and so few articles exist on the current topic, further illustrates the need for more research in this area, especially as it relates to suicide prevention among the population of interest.

Positive Symptoms and Premorbid IQ in Suicidal Individuals with Schizophrenia

Three studies included positive symptoms with premorbid IQ or IQ variables (Kaplan & Harrow, 1996; Kim et al., 2003; Pluck et al., 2013). The first study by Kaplan and Harrow (1996) looked at 70 individuals with schizophrenia and 97 individuals with depression, all of whom were hospital patients. Follow-ups occurred at 2-year and 7.5-year intervals to determine the impact of positive and negative symptoms on later suicide (Kaplan & Harrow, 1996).

Results indicated that only 15% of participants with schizophrenia and high IQ scores were more likely to show suicidal thoughts and behaviors later, while 29% of participants with schizophrenia and low IQs were more likely to show suicidal thoughts and behaviors later in life (29%, $x^{2} = 1.69$, df = 1, Fisher's exact p = .19), but the results were not statistically significant (Kaplan & Harrow, 1996). However, 17% of participants with depression and high IQ scores were more likely to demonstrate suicidal behaviors later, compared to those with depression and low IQs (3%, $x^{2} = 4.27$, df = 1, Fisher's exact p = .04; Kaplan & Harrow, 1996). In summary, participants with depression and high IQs were more likely to have subsequent suicidal thoughts

and behaviors rather than participants with schizophrenia and high IQs (Kaplan & Harrow, 1996).

Results independent of IQ-related variables revealed that, of the 40 individuals with schizophrenia who reported psychotic activity at the 2-year follow-up, 32% exhibited suicidal thoughts and behaviors at the 7.5-year follow-up, as compared to only 10% of schizophrenia patients with no psychotic activity at the 2-year follow-up who demonstrated later suicidal thoughts and behaviors ($x^2 = 4.63$, df = 1, $p < .05$; Kaplan & Harrow, 1996). Of the 34 patients with schizophrenia who reported hallucinations at the 2-year follow-up, 36% were at higher risk of demonstrating suicidal behaviors later in life compared to patients with schizophrenia who denied hallucinations (11%; $x^2 = 5.52$, df = 1, $p < .05$; Kaplan & Harrow, 1996). Of the 37 participants with schizophrenia, who reported symptoms of delusions at the 2-year follow-up, 32% had higher risks of having suicidal thoughts or behaviors later in life as compared to 12% of individuals with schizophrenia who did not have delusional symptoms (x^2 (1, $N = 167$) = 3.83, $p < .05$; (Kaplan & Harrow, 1996). Among the depression participants, psychotic activity, hallucinations, or delusions at the 2-year follow-up were related to subsequent suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996). In neither the schizophrenia ($x^2 = 0.44$, $df = 1$, Fisher's exact $p < .51$) nor the depression ($x^2 = 0.20$, $df = 1$, Fisher's exact $p < .54$) participant groups did those who experienced a thought disorder at the 2-year follow-up end up at risk of subsequent suicidal activity at the 7.5-year follow-up (Kaplan & Harrow, 1996).

The Kaplan and Harrow (1996) study had some limitations. First, the sample consisted of participants who were in treatment, so the results may not be generalizable to untreated individuals with schizophrenia. Next, the study explored the term referred to as *suicide activity*, which included thoughts, attempts and completions, rather than each individual concept, so it did

not examine more specific aspects of suicide along with IQ and schizophrenia symptoms to determine a potential relationship. The study did not assess premorbid IQ, but rather an estimated IQ using the Information Subtest for the Wechsler Adult Intelligence Scale, Revised (WAIS-R; Wechsler, 1981), so the study did not examine the relationship between premorbid IQ, suicide, and schizophrenia. Even though the study explored IQ and suicide together and also considered positive symptoms and suicide together, it did not examine all three variables (IQ, suicide, and positive symptoms) together to determine a relationship (Kaplan & Harrow, 1996).

The Kaplan and Harrow (1996) study had many strengths, including the large sample size, which increased the reliability of the study results, the study's statistical power, and its ability to detect group differences. Also, the researchers used the RDC (Spitzer et al., 1978), which is an industry standard within the clinical research field, to diagnose participants. Further, the researchers employed reliable methods to determine suicide deaths by autopsy report or death registries and assessed suicide attempts by using SADS (Endicott & Spitzer, 1978). In summary, Kaplan and Harrow (1996) were able to suggest that a low IQ was more of a risk factor for subsequent suicide among individuals with schizophrenia than a high IQ, and a high IQ was more of a risk factor for subsequent suicide among depressed individuals than a low IQ. They found that positive symptoms were risk factors for later suicidal thoughts and behaviors among individuals with schizophrenia but not among individuals with depression (Kaplan & Harrow, 1996).

The second study by Pluck et al. (2013) looked at 87 individuals (78 men and 9 women) with schizophrenia to assess substance use, depression, hopelessness, negative and positive symptoms, and insight to investigate their impact on self-harm. Research participants were individuals recruited from local psychiatric hospitals as well as individuals from the community

in a metropolitan area in the U.K. (Pluck et al., 2013). The researchers divided participants into two groups: those with and without a history of self-harm, which included suicide attempts (Pluck et al., 2013). Results indicated that, compared to the group with no history of self-harm (90.0 (13.0)), those with a history of self-harm (99.5 (15.5), OR = 1.06, p = 0.011) were more likely to have significantly higher estimated premorbid IQ scores (Pluck et al., 2013). However, the study did not find that individual or total positive or negative symptoms significantly correlated with self-harm (Pluck et al., 2013).

The Pluck et al. (2013) study had some limitations. First, even though the sample size was adequate, the researchers recruited participants from local hospitals and the community in the U.K., so the results may not be generalizable to untreated individuals with schizophrenia in other geographic locations. Also, the study did not indicate the number of participants in the community versus those from psychiatric hospitals, so it may be difficult to determine how generalizable the results are to an inpatient population versus individuals with schizophrenia in the community. Next, the study design was cross-sectional, which prevented the researchers from investigating any causal factors related to self-harm or suicide attempts. Another limitation was that a clinical team gave the schizophrenia diagnoses, but only one psychiatrist confirmed the diagnoses, so inter-rater reliability was unknown. The study included individuals who participated in non-suicidal self-harm with those who had a history of suicide attempts, which made the definition of self-harm broader, so the exact relationship between IQ and suicide was unclear. Additionally, even though researchers used a standardized assessment tool to assess non-suicidal self-harming behaviors, suicide attempts as determined by the participants were also included to classify those who reported self-harm histories, which further obscured the definition of self-harm. Confounds such as including participants with both depression and polysubstance

use may have altered study results, both of which have been found in other studies to correlate highly with self-harm (Gupta et al., 2019; Subica et al., 2016) versus suicide. There were significantly more male than female participants, so the results may not be generalizable to most female individuals with schizophrenia. Lastly, the study did not address attrition, so it is unknown if the study used the same sample throughout, which could skew study results (Pluck et al., 2013).

Pluck et al. (2013) did have many strengths, including the adequate sample size (N = 87), which increased the validity of the results as well as its statistical power, so any group differences detected more likely represented true differences. Another strength included the standardized assessment measurements the study used, such as the Calgary Depression Scale (CDS; Addington et al., 1993), the NART (Nelson & Willison, 1991), the SAPS (Andreasen, 1984), and the SANS (Andreasen, 1989), which increased the validity of the results. In summary, the Pluck et al., (2013) study was able suggest that participants with a history of self-harm were more likely to have a higher premorbid IQ, and positive symptoms did not correlate with self-harm.

The last study by Kim et al. (2003) assessed suicide risk among 333 individuals with schizophrenia and a possible relationship with cognitive functioning, insight, and hopelessness. The researchers recruited participants from hospitals in the Cleveland area (Kim et al., 2003). Approximately 80.5% of participants had also participated in other research studies previously, so the researchers required that they stop taking their psychotropic medications for five days prior to participating in the new study (Kim et al., 2003).

Study results indicated that participants who reported lifetime suicidal thoughts and behaviors had better performance on processing speed, memory, and executive functioning tasks

compared to those with no suicide histories (Kim et al., 2003). Those who reported lifetime suicidal thoughts and behaviors also reported significantly more depressive and anxious symptoms, but not positive or negative symptoms of schizophrenia, compared to those who did not have lifetime suicidal thoughts and behaviors (Kim et al., 2003). The researchers also found no differences on IQ scores between participants who reported being currently suicidal and those who were not currently suicidal (Kim et al., 2003).

There were some limitations in the Kim et al. (2003) study. For instance, there were more male than female participants, so the results may not be applicable to most female individuals with schizophrenia. Some of the study participants came from a research hospital, so they may have been subject to participant bias, which could alter the study results. Since the researchers recruited participants from hospitals in Cleveland, the results may not be generalizable to untreated individuals with schizophrenia in other geographic areas. Most of the participants were medication naïve prior to the baseline assessment, which could have inflated symptoms and skewed study results. Some of the participants reported substance abuse, which could have been a confounding variable. Even though the researchers looked at IQ, positive symptoms, and suicide, they did not explore these variables together to determine a possible relationship. Because the design was prospective, the study could not determine cause and effect, and results may not be replicable in time periods other than the study period (Kim et al., 2003).

The Kim et al. (2003) study had several strengths, including the large sample size (N = 333), which increased its statistical power and the study's ability to detect group differences. The researchers used a standardized diagnostic tool, the DSM-III-R (APA, 1987), and standardized assessment tools, such as the BPRS (Overall & Gorham, 1962) and the WAIS-R (Wechsler, 1981). A clinician with a master's degree administered the assessments, increasing the internal

and external validity of the results. The researchers also attempted to reduce external confounding variables by excluding those with head or brain injuries. In summary, the Kim et al. (2003) study was unable to find a correlation between suicide, positive symptoms, and IQ.

The studies that explored positive symptoms and IQ as risk factors had mixed results (Kaplan & Harrow, 1996; Kim et al., 2003; Pluck et al., 2013). Only one of the three studies yielded statistically significant results regarding IQ and self-harm, which included suicide attempts among individuals with schizophrenia (Pluck et al., 2013). One study found correlations between positive symptoms and subsequent suicide (Kaplan & Harrow, 1996). Two of the studies did not find a correlation between positive symptoms and suicide (Kim et al., 2003) or self-harm (Pluck et al., 2013). None of the studies looked at positive symptoms, suicide, and IQ variables together (Kaplan & Harrow, 1996; Kim et al., 2003; Pluck et al., 2013).

Summary and Critique of IQ Studies

How does premorbid intelligence quotient (IQ) impact the relationship between positive symptoms and suicide in individuals with schizophrenia? This section will provide an overview of the literature in this chapter as a whole, followed by key findings, and will conclude with a summary regarding the quality of the current literature on suicidal individuals with schizophrenia, both with and without positive symptoms, and the relationship with IQ. There were only six studies in the current review (Barrett et al., 2011; Kaplan & Harrow, 1996; Kim et al., 2003; Pluck et al., 2013; Webb et al., 2011; Weiser et al., 2015), three of which were on IQ and suicide (Barrett et al., 2011; Webb et al., 2011; Weiser et al., 2015) and three which were on IQ, positive symptoms, and suicide (Kaplan & Harrow, 1996; Kim et al., 2003) or self-harm (Pluck et al., 2013). Four (Barrett et al., 2011; Pluck et al., 2013; Webb et al., 2011; Weiser et al., 2015) of the six studies were published in the past 10 years. Two of the six studies were

conducted and published in the U.S. (Kaplan & Harrow, 1996; Kim et al., 2003), three were in Europe (Barrett et al., 2011; Webb et al., 2011; Pluck et al., 2013), and one was in Israel (Weiser et al., 2015). All of the studies in this chapter used adequate to large sample sizes, two of which were large population studies (Webb et al., 2011; Weiser et al., 2015) and four of which were prospective design studies (Barrett et al., 2011; Kaplan & Harrow, 1996; Kim et al., 2003; Pluck et al., 2013).

Two of the studies that did not have positive symptoms as a variable found high IQ was a risk factor for suicide in two of the studies (Webb et al., 2011; Weiser et al., 2015). Webb et al. (2011) also found a low IQ was a protective factor for suicide. The third such study (Barrett et al., 2011) yielded no differences in IQ scores between those who attempted suicide and those who did not attempt suicide. Among the studies that used positive symptoms as a variable, one study (Kaplan & Harrow, 1996) reported that a low IQ and positive symptoms were both risk factors for suicide among individuals with schizophrenia, but as independent variables. Even though the second study indicated that higher IQ was a risk factor, it was for self-harm rather than suicide (Pluck et al., 2013). The third study found no correlations between IQ, positive symptoms, or suicide (Kim et al., 2003).

Overall, the findings in the current review section do not support a relationship between IQ and positive symptoms as risk factors for suicide among individuals with schizophrenia. Since two studies (Webb et al., 2011; Weiser et al., 2015) found a high IQ to be a risk factor for suicide, more research is necessary in this area. One study (Kaplan & Harrow, 1996) was able to identify three types of individual positive symptoms (psychotic activity, hallucinations, and delusions) as suicide risk factors among individuals with schizophrenia but not among individuals with depression, so more studies in this area are also needed. Kaplan and Harrow

(1996) also found that individuals with depression and high IQs were at greater risk for subsequent suicide, so more research is required in this area. Larger population studies, such as Webb et al. (2011) and Weiser et al. (2015), that explore the three variables together (IQ, positive symptoms, and suicide) may yield correlating results. More studies that use a combination of inpatients and outpatients in various geographic locations would also allow the samples to be more representative of most suicidal individuals with schizophrenia. Ideal studies would be longitudinal studies using long-term, residential, inpatients that assess IQ, positive symptoms, and suicide at the onset of a schizophrenia diagnosis and that follow participants for multiple years with more frequent follow-up periods. In summary, more studies that explore IQ, positive symptoms, and suicide variables together among individuals with schizophrenia are necessary to identify suicide risk factors early and incorporate them into treatment plans for people with schizophrenia who also have unusual cognition.

CHAPTER V: DISCUSSION

The purpose of the present literature review was to evaluate the effects of gender, race and ethnicity, and premorbid intelligence on the relationship between positive symptoms and suicide among individuals with schizophrenia. The effects of sociodemographic and biological gender differences were also explored to better understand differences among individuals with schizophrenia at low and high risk of suicide. Other cultural factors that may contribute to risk of suicide and schizophrenia symptoms were not evident in the current review. However, related information was discussed in the review of race and ethnicity factors to further our understanding of mental illness among ethnic minorities. A brief review of the role of cognitive deficits as risk factors for individuals with schizophrenia was used to contextualize the possible influence of IQ differences on suicide risk among individuals with schizophrenia, with and without positive symptoms. The present review revealed mixed findings regarding the relationship between risk factors and suicide in individuals with schizophrenia.

Research Questions and Hypotheses

RQ1: How does gender impact the relationship between positive symptoms and suicide in individuals with schizophrenia? It was hypothesized that gender would have an influence on the association between suicide and positive symptoms among individuals with schizophrenia.

RQ2: How does race or ethnicity impact the relationship between positive symptoms and suicide in individuals with schizophrenia? It was hypothesized that race and ethnicity would have an influence on the association between suicide and positive symptoms among individuals with schizophrenia.

RQ3: How does premorbid intelligence quotient (IQ) impact the relationship between positive symptoms and suicide in individuals with schizophrenia? It was hypothesized that IQ

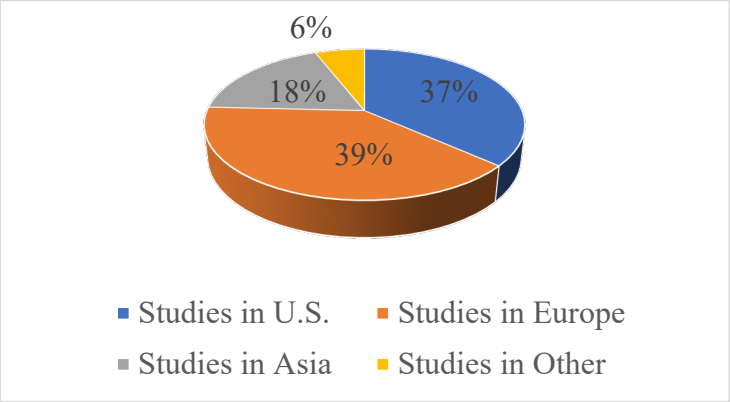
would have an influence on the association between suicide and positive symptoms among individuals with schizophrenia.

Summary of Limitations

Conclusions we can draw from the present work are limited for several reasons such as there were too few research studies that contained the inclusion criteria for this review, which limits knowledge for clinicians and researchers in suicide prevention among the population of interest and generalizability of the studies' findings. The present review includes analysis of 37 studies. Only 37% of these studies were conducted in the U.S., while 63% of the studies were conducted in other countries (see Figure 1). For U.S. clinicians to stay abreast of the most current information on suicide risk factors and treatment among those with schizophrenia, they must break barriers and forge ahead with clinical research that informs their clinical practice, much like their Asian and European counterparts.

Figure 1

Percentage of Studies by Country



Furthermore, over half (63%) of all the studies in this review are more than 10 years old. As previously mentioned, many world and national events have occurred over the past 10 or more

years that may alter or otherwise influence suicide risk and schizophrenia symptomatology among the populous of interest, such as the influx of new immigrants, current social climate, changes in political leadership, and healthcare reform. Diagnostic criteria have also changed, intelligence testing protocols have been revised, and gender roles have continued to evolve over the past 10 years. These changes suggest that more current research is needed to understand the current trajectory of these phenomena.

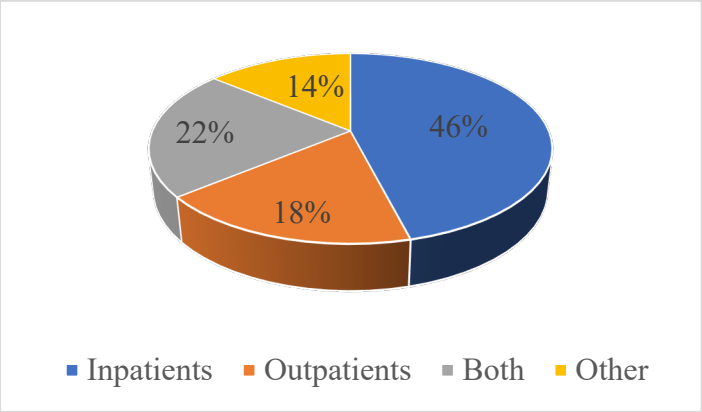
Most of the studies in the current review (53%) have small samples, comprising 50 schizophrenia participants or fewer, which is considered a small sample in the current review. This represents a potential limitation, as large sample sizes may be necessary to provide adequate statistical power to detect group differences, such as differences in suicide risk across genders. For example, in work by Kaplan et al. (2016), 252 participants were assessed, including 97 individuals with a schizophrenia diagnosis. In contrast, Lyu and Zhang (2014) recruited 392 participants, of which 38 were individuals with a schizophrenia diagnosis. Kaplan et al. (2016) did not detect differences in suicidal activity (thoughts, behaviors, and deaths) between male and female participants, while Lyu and Zhang (2014) found that more women died by suicide than men. The sample size differences between these two studies may explain the different findings. Furthermore, Kaplan et al. (2016) included more male than female participants, whereas Lyu and Zhang's (2014) sample included a greater proportion of female participants. This may have influenced their finding that women were more likely to have died by suicide, while Kaplan et al. (2014) found that men died by suicide earlier than women following placement in inpatient care.

Most of the studies in the current review utilize inpatient samples (see Figure 2). Thus, many studies' findings may not be generalizable to individuals with schizophrenia in an outpatient setting or those who are untreated. Importantly, individuals in inpatient settings

experience more severe symptoms and are also more likely to be suicidal, as that is often a reason for admission. However, only 20% of individuals with schizophrenia attempt suicide overall, so inpatient samples may not be representative of the broader population of individuals with schizophrenia.

Figure 2

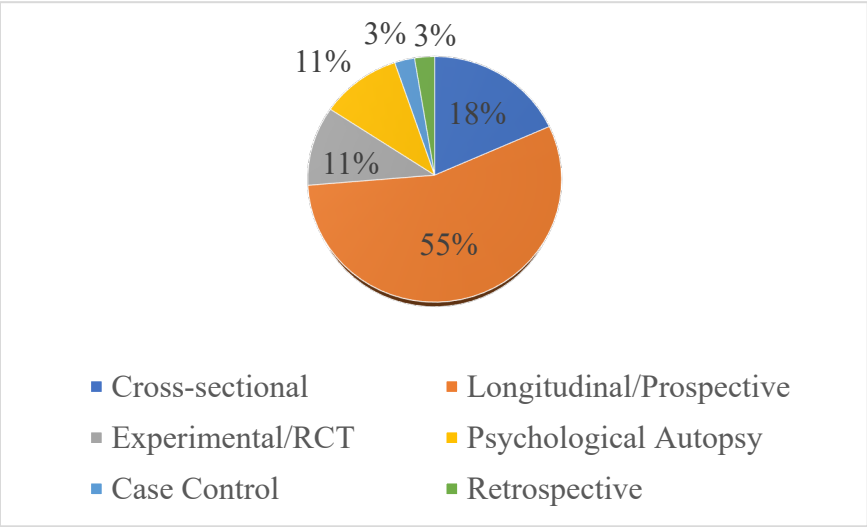
Participant Sample Types



Similarly, most of the study designs in the current review were longitudinal/prospective and other designs that are subject to confounding variables and are observational, so the study environments are not as controlled as in an experimental study (see Figure 3). However, it is unlikely that an institutional review board would grant approval for an experimental study of this nature, and it would not be easy to randomly assign participants by gender, suicide status or the other variables used in the current review, except in a treatment study, so observational studies are more practical for accessing study participants, especially from vulnerable populations, like those with schizophrenia.

Figure 3

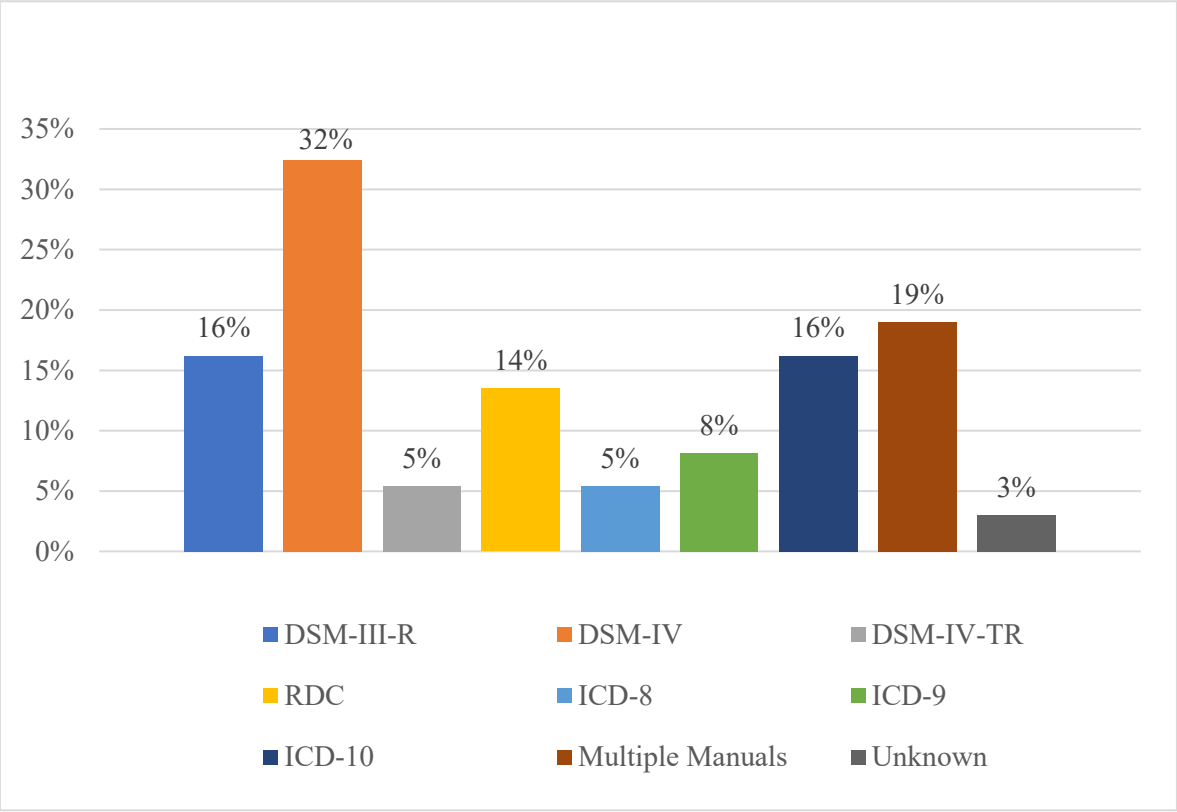
Study Design



Most of the studies used an older diagnostic manual that included schizophrenia subtypes (see Figure 4), which have been omitted from the current *DSM-5* (APA, 2013). As a result, studies with the paranoid subtype referred to as a positive symptom (Heilä et al., 1999; Saarinen et al., 1999) may not have been included in this review. However, other studies that used older diagnostic manuals with the schizophrenia subtypes in addition to an assessment tool which measured positive symptoms (Atalay & Atalay, 2006; Tang et al., 2007; Usall et al., 2011) such as the SAPS (Andreasen, 1984) or PANSS (Kay et al., 1987), would have been included in this review regardless of the diagnostic manual used.

Figure 4

Diagnostic Manual Type



There were 37 articles reviewed in the present work (see Figure 5), one of which (Kaplan & Harrow, 1996) was utilized in Chapters I and IV. For purposes of the current review, the studies included were categorized into different levels of relevance to the review variables from most relevant to least relevant (see Figure 6). The most relevant studies included positive symptoms plus one of the chapter variables such as gender, race/ethnicity, or IQ. Studies which included positive symptoms and suicide among individuals with schizophrenia without one of the chapter variables were less relevant. The studies that included suicide without positive symptoms were of secondary relevance, and studies that included positive symptoms without suicide were considered least relevant to the current review variables. There were 22 studies

(59%) that explored both positive symptoms and suicide (Abdollahian et al., 2009; Atalay & Atalay, 2006; Baca-Garcia et al., 2005; Barrett et al., 2011; Bertelsen et al., 2007; Bhui & MacKenzie, 2008; Bornheimer, 2016; Bornheimer & Jaccard, 2017; Fox et al., 2004; Heilä et al., 1999; Kaplan & Harrow, 1996; Kaplan & Harrow, 1999; Kaplan et al., 2012; Kim et al., 2003; Lewis et al., 1996; Saarinen et al., 1999; Simms et al., 2007; Tang et al., 2007; Usall et al., 2001; Yan et al., 2013) and two studies (5%) that assessed positive symptoms and self-harm without addressing suicidal thoughts or intent (Lee et al., 2004; Pluck et al., 2013). Only 10 studies included one of the three primary study variables: gender, race/ethnicity, or IQ (Abdollahian et al., 2009; Atalay & Atalay, 2006; Bhui & MacKenzie, 2008; Kaplan & Harrow, 1996; Kaplan et al., 2012; Kim et al., 2003; Lee et al., 2004; Lewis et al., 1996; Pluck et al., 2013; Tang et al., 2007). Chapter I included the largest number of relevant articles to the current review, but the articles that included positive symptoms and suicide in subsequent chapters were considered the most relevant in topic to the current review in Chapters II, IV, and III, respectively.

There were 12 studies (32%) that only explored suicide, and were thus of secondary relevance in the current review (Barrett et al., 2011; Carlborg et al., 2010; De Luca et al., 2010; Fulginiti & Brekke, 2016; Høye et al., 2011; Kaplan & Harrow, 2018; Kaplan et al., 2016; Karch et al., 2006; Limosin et al., 2007; Lyu & Zhang, 2014; Webb et al., 2011; Weiser et al., 2015). Chapter II had twice as many of these secondary articles as Chapters III or IV. There were five studies (14%) that only explored positive symptoms, representing the least relevant articles for the present review (Chaves et al., 1993; Nopoulos et al., 1997; Ray et al., 2019; Shtasel et al., 1992; Usall et al., 2001). Three of these were presented in the sociodemographic section of Chapter I (Chaves et al., 1993; Shtasel et al., 1992; Usall et al., 2001) and two were addressed in the biological section (Nopoulos et al., 1997; Ray et al., 2019). Throughout the search, there

were more articles that addressed positive symptoms and suicide variables in isolation, with few that addressed the gender, race/ethnicity, or IQ variables as well. This further supports the notion that more research is needed in these areas.

Figure 5

Count of Studies by Variable and Chapter

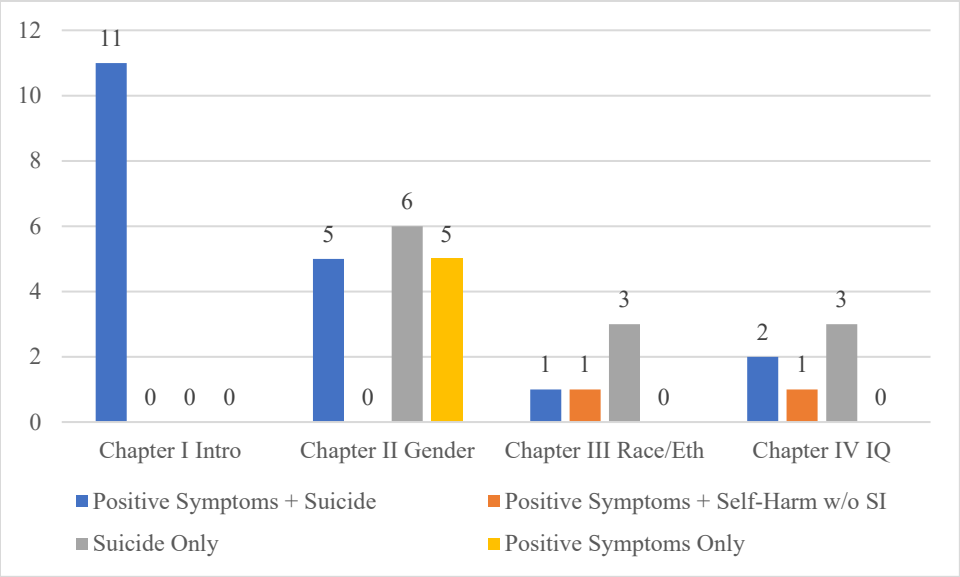
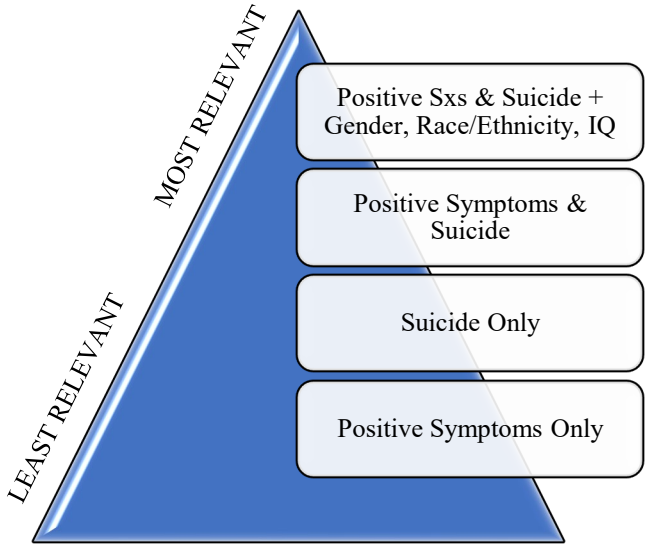


Figure 6

Study Relevance Levels



An in-depth examination of the 22 studies that explored positive symptoms and suicide or self-harm revealed that 14 (64%) of those studies addressed individual positive symptoms and suicide (Atalay & Atalay, 2006; Baca-Garcia et al., 2005; Bertelsen et al., 2007; Bhui & McKenzie, 2008; Bornheimer, 2016; Bornheimer & Jaccard, 2017; Fox et al., 2004; Kaplan & Harrow, 1996, 1999; Kaplan et al., 2012; Simms et al., 2007; Usall et al., 2001) or self-harm (Lee et al., 2004; Pluck et al., 2013), eight studies (36%) assessed total positive symptoms and suicide together, and three studies (14%) examined total positive symptoms and suicide separately. An additional three studies, representing 8% of all studies, addressed both individual and total positive symptoms with suicide (Atalay & Atalay, 2006; Pluck et al., 2013; Usall et al., 2001). Among the studies that looked at individual positive symptoms, all but one (Kaplan & Harrow, 1996) yielded statistically significant correlations. Of the individual positive symptoms studies, 13 (92%) explored delusions or hallucinations (Baca-Garcia et al., 2005; Bertelsen et al., 2007; Bhui & McKenzie, 2008; Bornheimer, 2016; Bornheimer & Jaccard, 2017; Fox et al., 2004; Kaplan & Harrow, 1996, 1999; Kaplan et al., 2012; Lee et al., 2004; Pluck et al., 2013; Simms et al., 2007; Usall et al., 2001), two of which assessed self-harm rather than suicide (Lee et al., 2004; Pluck et al., 2013). Additionally, two (14%) of the individual positive symptoms studies explored positive thought disorders (Atalay & Atalay, 2006; Kaplan & Harrow, 1996) with suicide. Please note that Kaplan and Harrow (1996) explored delusions and hallucinations as well as positive thought disorder with suicide.

Among the studies that looked at total positive symptoms, eight studies (22%) explored total positive symptoms and suicide variables together (Abdollahian et al., 2009; Barrett et al., 2011; Heilä et al., 1999; Lewis et al., 1996; Pluck et al., 2013; Saarinen et al., 1999; Usall et al., 2001; Yan et al., 2013) and three studies (8%) assessed total positive symptoms and suicide

variables separately (Atalay & Atalay, 2006; Kim et al., 2003; Tang et al., 2007). Only two of the studies that explored total positive symptoms and suicide together yielded statistically significant correlations (Abdollahian et al., 2009; Yan et al., 2013). The remaining six studies that explored total positive symptoms and suicide together either exhibited methodological problems related to how positive symptoms were assessed (Heilä et al., 1999; Saarinen et al., 1999) or found no correlations (Barrett et al., 2011; Lewis et al., 1996; Pluck et al., 2013; Usall et al., 2001). Of the studies which explored total positive symptoms and suicide together, two of those studies also explored individual positive symptoms (Pluck et al., 2013; Usall et al., 2001), one of which found more men with increased scores on the grandiosity subscale of the PANSS (Kay et al., 1987) but no gender differences in total positive symptom scores (Usall et al., 2001), which further supports the concept of exploring individual positive symptoms rather than total positive symptoms. Alternate reasons for the other study which explored both total and individual positive symptoms (Pluck et al., 2013) as having no significant correlations with self-harm include the fact that this study explored self-harm rather than suicide, and it also had less than half the sample size of the Usall et al. (2001) study. The three remaining studies explored total positive symptoms and suicide variables separately (Atalay & Atalay, 2006; Kim et al., 2003; Tang et al., 2007). In summary, of the studies that explored total positive symptoms and suicide, most either did not yield correlations or exhibited problems with study methods. In contrast, the vast majority of studies that explored individual positive symptoms found statistically significant correlations. These results suggest that future studies should probe the relationship between individual positive symptoms and suicide among individuals with schizophrenia. This should also be considered during treatment planning. The ability to pinpoint

the most problematic positive symptoms for an individual with schizophrenia would allow clinicians to tailor pharmacological or psychotherapeutic regimens.

Recommendations for Research

Past research has found that SES can impact access to mental health care (Aguilar-Gaxiola et al., 2012; Durà-Vilà & Hodes, 2012). The current review found differences in suicide rates between White and Black men and women with schizophrenia who had different social statuses (Kaplan & Harrow, 2018). The current review also uncovered an adjunct study (Liu et al., 2015) that suggested that access to care may be a contributing factor to high suicide risk among Chinese women with schizophrenia. Given this preliminary research, it is recommended that future work include analysis of SES impacts on suicide risk and positive symptoms in schizophrenia across gender, racial, and ethnic groups.

None of the studies in the current review addressed cultural explanations for suicide or schizophrenia symptoms. However, Karch et al. (2006) found differences in suicide rates among African American participants, both with and without a schizophrenia diagnosis, when compared with other racial groups. Furthermore, past work has indicated that African Americans are diagnosed with schizophrenia more often than members of other racial groups (Barnes, 2004; Blow et al., 2004; Bresnahan et al., 2007; Choi et al., 2012). More research is necessary to unpack these types of clinical phenomena among different racial and ethnic groups. Improving our understanding of these relationships could improve misdiagnosis and suicide rates and help practitioners provide more culturally appropriate treatment.

Several studies in the current review revealed correlations between hallucinations (Bertelsen et al., 2007; Bornheimer, 2016; Bornheimer & Jaccard, 2017), specifically auditory (Simms et al., 2007) or command hallucinations (Baca-Garcia et al., 2005; Fox et al., 2004; Lee

et al., 2004), and suicide or self-harm. Similarly, a number of studies in the current review supported the presence of relationships between delusions and suicide (Baca-Garcia et al., 2005; Bertelsen et al., 2007; Bornheimer, 2016; Bornheimer & Jaccard, 2017; Kaplan & Harrow, 1996, 1999; Kaplan et al., 2012). More in-depth research in these areas is necessary to better understand how gender, race, and ethnicity affect these relationships. Future studies should utilize standardized, cross-cultural assessment tools to help clinicians and researchers distinguish between cultural beliefs and positive symptoms such as the Mini International Psychiatric Interview (Sheehan et al., 1998).

The current review did not indicate a relationship between all three variables, IQ, suicide (Barrett et al., 2011; Kaplan & Harrow, 1996; Kim et al., 2003), or self-harm (Pluck et al., 2013) and positive symptoms. However, an association between IQ and suicide risk was found (Kaplan & Harrow, 1996; Webb et al., 2011; Weiser et al., 2015) as well as between positive symptoms and suicide risk (Kaplan & Harrow, 1996) among individuals with schizophrenia. Other studies have found correlations between insight (into one's illness) and suicide among participants with first episode psychosis (López-Moríñigo et al., 2014) or between insight, cognitive abilities, and suicide among individuals with schizophrenia (Villa et al., 2018). Thus, it is hypothesized that high premorbid IQ, increased insight and positive symptoms are predictors of subsequent suicide risk among individuals with schizophrenia. Given past findings, future work should employ a large-scale, longitudinal design using long-term, residential inpatients and an outpatient or untreated comparison group to assess premorbid IQ, individual positive symptoms, insight, and suicide at the onset of a schizophrenia diagnosis. This work could follow participants for multiple years with more frequent follow-up periods (e.g., annually) to provide fine-grained, longitudinal data.

Clinical Implications

It is imperative to provide culturally competent mental health care that is inclusive of all genders, races, and ethnic minority groups to address clinical issues, such as poor access to care, over-pathologizing, and misdiagnosing of marginalized groups. Proper diagnostic, assessment, and treatment methods and practices are also necessary to ensure individuals with schizophrenia have access to high-quality, effective mental health treatment options, given the chronic nature of the disorder, its associated cognitive deficits, and socioeconomic burden. As such, diversity training should begin at the graduate school level and continue throughout the clinician's career via continuing education credits. This is pursuant to APA's guidelines for multicultural training, assessment, and practice for psychologists (American Psychological Association, 2017). One study on 66 U.S. medical hospitals with cultural competence training revealed more positive experiences among ethnic minority patients regarding communication with hospital staff and in pain management (Weech-Maldonado et al., 2012). Another study reported that 85% of psychologists took at least one diversity course as part of their degree requirements (Benuto et al., 2019). As such, there still seems to be significant room for improvement regarding the quality of diversity courses and training psychologists receive as well as supervised clinical experiences with diverse populations.

There are a few evidence-based treatment (EBT) modalities for schizophrenia, some of which have been found to be more efficacious than others. For instance, cognitive remediation training was found to significantly increase social and cognitive functioning among participants with schizophrenia in Italy (Bechi et al., 2020) and the United Kingdom (Thomas & Rusten, 2019). Two U.K. studies found brief cognitive behavioral therapy to be more effective. The first examined its effectiveness among women with schizophrenia and those with delusions (Brabban

et al., 2009). The other study found significant reductions in depression and general symptoms as well as increases in insight (Turkington et al., 2002) among individuals with schizophrenia. Cognitive behavioral therapy for psychosis (CBTp) studies have demonstrated small to medium effect sizes for between-group comparison to treatment as usual groups, and CBTp seemed to only briefly reduce delusions (Mehl et al., 2015; Sitko et al., 2020). Moreover, another study found high rates of treatment disengagement or dropouts from CBTp treatment (Richardson et al., 2019). As with many dialectical behavioral therapy (DBT) treatment studies (Steil et al., 2011; Yang et al., 2020), psychosis was exclusion criteria for participants, so it was difficult to find many studies which used DBT for schizophrenia symptoms.

It is recommended that psychosocial rehabilitation (PSR) interventions be used with individuals with schizophrenia due to the pervasive nature of the disorder, which can negatively affect every aspect of the patient's life. PSRs are designed to teach individuals with mental illnesses, such as schizophrenia, skills related to social, cognitive, and emotional functioning to help them more easily reintegrate from a relapse or inpatient stay back into their home and work environments. Quality of life was found to increase among schizophrenia participants in Italian (Buonocore et al., 2018) and Chinese (Zhang et al., 2014) studies.

Family therapy is another psychosocial intervention that was found to elicit positive outcomes for both the patients and families (Carrá et al., 2007; Girón et al., 2015). Specifically, patients undergoing family therapy may experience increased treatment compliance (Carrá et al., 2007) and family members and caregivers may exhibit greater empathy (Girón et al., 2015). It is recommended that clinicians recommend family therapy for their clients with schizophrenia.

Providing psychoeducation regarding exercise and diet is an important aspect of any patient's treatment regime, but it is especially important for individuals with schizophrenia, since

they are more likely to engage in unhealthy dietary and lifestyle practices (Jakobsen et al., 2018). This is critical, as significant improvements in schizophrenia symptoms were reported in one study after 10 weeks of a 20-week exercise program (Silva et al., 2015). Thus, it is recommended that clinicians provide psychoeducation about exercise as an adjunct to pharmacological treatment. Similarly, psychoeducation regarding nutrition is important for individuals with schizophrenia. Nutritional education can affect patient outcomes, as described in work suggesting that pharmaceutical grade omega-3 fish oil supplements are effective reducing schizophrenia (Amminger et al., 2010; Qurashi et al., 2017) and extrapyramidal (Sivrioglu et al., 2007) symptoms. Furthermore, there is research suggesting that gluten-free diets may benefit individuals with schizophrenia. One study found improvements in negative but not positive symptoms (Kelly et al., 2019), while another study found improvements in all schizophrenia symptoms in addition to extrapyramidal symptoms (Jackson et al., 2012). Thus, encouraging individuals with schizophrenia to discuss diet and exercise with their primary care physicians is warranted.

Due to high rates of suicide attempt and death among individuals with schizophrenia (APA, 2013), assessing suicide risk, managing symptoms, and integrating prevention efforts are critical to treatment planning with the population of interest. It is recommended that clinicians utilize the Columbia-Suicide Severity Rating Scale (Posner et al., 2011), the gold standard for measuring suicidal thoughts and behaviors via a semi-structured interview. It is also recommended that clinicians use adjunctive standardized assessment tools, such as the Beck Scale for Suicide Ideation (BSI; Beck & Steer, 1991) or the Beck Suicidal Intent Scale (SIS; Beck et al., 1974) to further assess suicidal thoughts and intent via self-report. Due to insufficient empirical support for no-suicide contracts and further discouragement of their use by renowned

suicidologists, David Rudd, Michael Mandrusiak, and Thomas Joiner (2006), commitment to treatment statements (CTS) are recommended for use with suicidal clients with schizophrenia. CTS are alternatives to no-suicide contracts and are collaborative treatment agreements between the suicidal client and the clinician that focus on a client's commitment to treatment and living, rather than forcing the clients to relinquish their right to choose death by suicide (Rudd et al, 2006).

Although pharmacological treatment is beyond the scope of this paper, it should be noted that Clozapine is the only FDA approved neuroleptic to aid in the reduction of suicidal thoughts and behaviors among individuals with schizophrenia (Meltzer et al., 2003). However, due to its high associated cost and the fact that periodic blood panels are required to ensure proper metabolic functioning, many clinicians are reluctant to prescribe Clozapine. Nonetheless, Clozapine should be considered as a treatment option among the population of interest.

Lastly, the current review highlighted the need for updated schizophrenia symptom measures, as the PANSS (Kay et al., 1987), which was used in various studies (Abdollahian et al., 2009; Barrett et al., 2011; Chaves et al., 1993; Ray et al., 2019; Tang et al., 2007; Usall et al., 2001; Yan et al., 2013), only measures the severity of symptoms. Thus, the development of a semi-structured interview could help reveal how individual positive symptoms, such as command hallucinations, influence suicidal thoughts and behaviors.

Conclusion

The present review found that there is sufficient evidence to suggest a link between suicide and positive symptoms among individuals with schizophrenia that depends on gender and racial and ethnic minority group membership. Although only a few, sometimes mild, associations were detected, this work still suggests that some suicidal thoughts, behaviors, and

deaths may have been prevented had clinicians better understood the relationships among these variables. As clinicians and researchers, we are bound by ethics to avoid harm and to provide competent care (American Psychological Association, 2017). It is our duty to collaborate as professionals on efforts related to assessing, conceptualizing, diagnosing, and treating individuals in need. There is currently an insufficient amount of research regarding the relationship between suicide, positive symptoms, and premorbid IQ for individuals with schizophrenia. However, future research in this area is warranted given the evidence of associations between IQ and suicide (Kaplan & Harrow, 1996; Webb et al., 2011; Weiser et al., 2015) and positive symptoms and suicide (Kaplan & Harrow, 1996) in the current review. The research design and study variable adjustments recommended in this chapter can facilitate future work in this area.

Conducting research among individuals with severe mental illnesses, such as schizophrenia, is not an easy task, nor is it readily approved by institutional review boards. The ability to identify and convey the clinical implications of these studies to review boards is essential for future research projects. The history of clinical research has not always been kind or humane, so it will also be of the utmost importance to keep the individual in mind when conducting human research. As clinicians and researchers, we are called to advocate for those who do not have a voice, including individuals with schizophrenia, which is the essence of being a care provider.

References

Abdollahian, E., Modares Gharavi, M., Soltanifar, A., & Mokhber, N. (2009). Relationship between positive and negative symptoms of schizophrenia and psychotic depression with risk of suicide. *Iranian Journal of Psychiatry and Behavioral Sciences*, *3*(1), 27–32. https://sites.kowsarpub.com/ijpbs/articles/2836.html

Addington, D., Addington, J., & Maticka-Tyndale, E. (1993). Assessing depression in schizophrenia: The Calgary Depression Scale. *The British Journal of Psychiatry*, *163*(S22), 39–44. https://doi.org/10.1192/S0007125000292581

Aguilar-Gaxiola, S., Loera, G., Méndez, L., Sala, M., & Nakamoto, J. (2012). *Community-defined solutions for Latino mental health care disparities: California reducing disparities project, Latino strategic planning workgroup population report.* UC Davis.

American Psychiatric Association (1952). *Diagnostic and statistical manual of mental disorders* (1st ed.). American Psychiatric Association.

American Psychiatric Association (1968). *Diagnostic and statistical manual of mental disorders* (2nd ed.). American Psychiatric Association.

American Psychiatric Association (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). American Psychiatric Association.

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.). American Psychiatric Association.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). American Psychiatric Association.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). American Psychiatric Association.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Association.

American Psychological Association. (2017). *Ethical principles of psychologists and code of conduct*. https://www.apa.org/ethics/code/

Amminger, G. P., Schäfer, M. R., Papageorgiou, K., Klier, C. M., Cotton, S. M., Harrigan M, S. M., Mackinnon, A., McGorry, P., & Berger, G. E. (2010). Long-chain ω-3 fatty acids for indicated prevention of psychotic disorders: A randomized, placebo-controlled trial. *Archives of General Psychiatry*, *67*(2), 146–154. https://doi.org/10.1001/archgenpsychiatry.2009.192

Andreasen, N. C. (1984). *Scale for the assessment of positive symptoms (SAPS)*. University of Iowa.

Andreasen, N. C. (1989). The scale for the assessment of negative symptoms (SANS): Conceptual and theoretical foundations. *The British Journal of Psychiatry*, *155*(S7), 49–52.

Atalay, F., & Atalay, H. (2006). Gender differences in patients with schizophrenia in terms of sociodemographic and clinical characteristics. *German Journal of Psychiatry, 1*(4), Article 916198. https://doi.org/10.1155/2012/916198

Ayón, C., Marsiglia, F. F., & Bermudez-Parsai, M. (2010). Latino family mental health: Exploring the role of discrimination and familismo. *Journal of Community Psychology*, *38*(6), 742–756. https://doi.org/10.1002/jcop.20392

Baca-Garcia, E., Perez-Rodriguez, M. M., Sastre, C. D., Saiz-Ruiz, J., & De Leon, J. (2005). Suicidal behavior in schizophrenia and depression: A comparison. *Schizophrenia Research*, *75*(1), 77–81. https://doi.org/10.1016/j.schres.2004.08.028

Barnes, A. (2004). Race, schizophrenia, and admission to state psychiatric hospitals. *Administration and Policy in Mental Health and Mental Health Services Research*, *31*(3), 241–252. https://doi.org/10.1023/b:apih.0000018832.73673.54

Barnes, A. (2008). Race and hospital diagnoses of schizophrenia and mood disorders. *Social Work*, *53*(1), 77–83. https://doi.org/10.1093/sw/53.1.77

Barranco, R. E. (2016). Suicide, religion, and Latinos: A macrolevel study of US Latino suicide rates. *The Sociological Quarterly*, *57*(2), 256–281. https://doi.org/10.1111/soin.12342

Barrett, E. A., Sundet, K., Simonsen, C., Agartz, I., Lorentzen, S., Mehlum, L., Mork, E., Andreassen, O. A., & Melle, I. (2011). Neurocognitive functioning and suicidality in schizophrenia spectrum disorders. *Comprehensive Psychiatry, 52*(2), 156–163. https://doi.org/10.1016/j.comppsych.2010.06.001

Batty, G. D., Whitley, E., Deary, I. J., Gale, C. R., Tynelius, P., & Rasmussen, F. (2010). Psychosis alters association between IQ and future risk of attempted suicide: Cohort study of 1,109,475 Swedish men. *British Medical Journal, 340*, Article c2506. https://doi.org/10.1136/bmj.c2506

Bechi, M., Bosia, M., Buonocore, M., Agostoni, G., Bosinelli, F., Silvestri, M. P., Bianchi, L., Cocchi, F., Guglielmno, C., Spangaro, M., F., & Cavallaro, R. (2020). Stability and generalization of combined theory of mind and cognitive remediation interventions in schizophrenia: Follow-up results. *Psychiatric Rehabilitation Journal*, *43*(2), 140–148. https://doi.org/10.1037/prj0000379

Beck, A. T., Schuyler, D., & Herman, I. (1974). Development of suicidal intent scales. In A. T. Beck, H. L. Resnik, & D. J. Lettieri (Eds.), *The prediction of suicide*. Charles Press Publishers.

Beck, A. T., & Steer, R. A. (1988, 1993). *Manual for the Beck Hopelessness Scale.* Psychological Corporation.

Beck, A. T., & Steer, R. A. (1991). *BSI, Beck scale for suicide ideation: Manual.* Psychological Corporation.

Benuto, L. T., Singer, J., Newlands, R. T., & Casas, J. B. (2019). Training culturally competent psychologists: Where are we and where do we need to go? *Training and Education in Professional Psychology, 13*(1), 56–63. https://doi.org/10.1037/tep0000214

Bertelsen, M., Jeppesen, P., Petersen, L., Thorup, A., Le Quach, P., Christensen, T. Ø., Krarup, G., Jørgensen, P., & Nordentoft, M. (2007). Suicidal behaviour and mortality in first-episode psychosis: The OPUS trial. *The British Journal of Psychiatry*, *191*(S51), s140–s146. https://doi.org/10.1192/bjp.191.51.s140.

Bhui, K. S., & McKenzie, K. (2008). Rates and risk factors by ethnic group for suicides within a year of contact with mental health services in England and Wales. *Psychiatric Services*, *59*(4), 414–420. https://doi.org/10.1176/ps.2008.59.4.414

Bleuler, E. (1911). *Dementia praecox: Oder gruppe der schizophrenia*. Deuticke.

Blow, F. C., Zeber, J. E., McCarthy, J. F., Valenstein, M., Gillon, L., & Bingham, C. R. (2004). Ethnicity and diagnostic patterns in veterans with psychoses. *Social Psychiatry and Psychiatric Epidemiology*, *39*(10), 841–851. https://doi.org/10.1007/s00127-004-0824-7

Bornheimer, L. A. (2016). Moderating effects of positive symptoms of psychosis in suicidal ideation among adults diagnosed with schizophrenia. *Schizophrenia Research, 176*(2-3), 364–370. https://doi.org/10.1016/j.schres.2016.07.009

Bornheimer, L. A., & Jaccard, J. (2017). Symptoms of depression, positive symptoms of psychosis, and suicidal ideation among adults diagnosed with schizophrenia within the clinical antipsychotic trials of intervention effectiveness. *Archives of Suicide Research*, *21*(4), 633–645. http://dx.doi.org.nl.idm.oclc.org/10.1080/13811118.2016.1224990

Brabban, A., Tai, S., & Turkington, D. (2009). Predictors of outcome in brief cognitive behavior therapy for schizophrenia. *Schizophrenia Bulletin*, *35*(5), 859–864. https://doi.org/10.1093/schbul/sbp065

Bresnahan, M., Begg, M. D., Brown, A., Schaefer, C., Sohler, N., Insel, B., Vella, L., & Susser, E. (2007). Race and risk of schizophrenia in a US birth cohort: Another example of health disparity? *International Journal of Epidemiology*, *36*(4), 751–758. https://doi.org/10.1093/ije/dym041

Brown, A. S. (2006). Prenatal infection as a risk factor for schizophrenia. *Schizophrenia Bulletin, 32*(2), 200–202. https://doi.org/10.1093/schbul/sbj052

Buonocore, M., Bosia, M., Baraldi, M. A., Bechi, M., Spangaro, M., Cocchi, F., Bianchi L., Guglielmno, C., & Cavallaro, R. (2018). Achieving recovery in patients with schizophrenia through psychosocial interventions: A retrospective study. *Psychiatry and Clinical Neurosciences*, *72*(1), 28–34. https://doi.org/10.1111/pcn.12605

Carlborg, A., Winnerbäck, K., Jönsson, E. G., Jokinen, J., & Nordstrom, P. (2010). Suicide in schizophrenia. *Expert Review of Neurotherapeutics*, *10*(7), 1153–64. https://doi.org/10.1586/ern.10.82

Carrà, G., Montomoli, C., Clerici, M., & Cazzullo, C. L. (2007). Family interventions for schizophrenia in Italy: Randomized controlled trial. *European Archives of Psychiatry and Clinical Neuroscience*, *257*(1), 23–30. https://doi.org/10.1007/s00406-006-0677-z

Centers for Disease Control and Prevention. (2019). *Web-based injury statistics query and reporting system (WISQARS)*. U.S. Department of Health and Human Services. https://www.cdc.gov/injury/wisqars/index.html

Chadwick, P., Strauss, C., Jones, A. M., Kingdon, D., Ellett, L., Dannahy, L., & Hayward, M. (2016). Group mindfulness-based intervention for distressing voices: A pragmatic randomised controlled trial. *Schizophrenia Research*, *175*(1–3), 168–173. https://doi.org/10.1016/j.schres.2016.04.001

Chaves, A. C., Seeman, M. V., Mari, J. J., & Maluf, A. (1993). Schizophrenia: Impact of positive symptoms on gender social role. *Schizophrenia Research*, *11*(1), 41–45.

Chien, W. T., & Lee, I. Y. M. (2013). The mindfulness-based psychoeducation program for chinese patients with schizophrenia. *Psychiatric Services*, *64*(4), 376–379. https://doi.org/10.1176/appi.ps.002092012

Chien, W. T., & Thompson, D. R. (2014). Effects of a mindfulness-based psychoeducation programme for Chinese patients with schizophrenia: 2-Year follow-up. *British Journal of Psychiatry*, *205*(1), 52–59. https://doi.org/10.1192/bjp.bp.113.134635

Choi, M. R., Eun, H. J., Yoo, T. P., Yun, Y., Wood, C., Kase, M., Park J. I., & Yang, J. C. (2012). The effects of sociodemographic factors on psychiatric diagnosis. *Psychiatry Investigation*, *9*(3), 199–208. https://doi.org/10.4306/pi.2012.9.3.199

Copeland, L. A., Mortensen, E. M., Zeber, J. E., Pugh, M. J., Restrepo, M. I., & Dalack, G. W. (2007). Pulmonary disease among inpatient decedents: Impact of schizophrenia. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *31*(3), 720–726. https://doi.org/10.1016/j.pnpbp.2007.01.008

Crump, C., Winkleby, M. A., Sundquist, K., & Sundquist, J. (2013). Comorbidities and mortality in persons with schizophrenia: A Swedish national cohort study. *The American Journal of Psychiatry*, *170*(3), 324–333. https://doi.org/10.1176/appi.ajp.2012.12050599

Davison, G. C., & Neale, J. M. (1975). *Abnormal psychology*. Wiley.

De Luca, V., Tharmalingam, S., Zai, C., Potapova, N., Strauss, J., Vincent, J., & Kennedy, J. L. (2010). Association of HPA axis genes with suicidal behaviour in schizophrenia. *Journal of Psychopharmacology*, *24*(5), 677–682. https://doi.org/10.1177/0269881108097817

Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, *49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Drapeau, C. W., & McIntosh, J. L. (2017, December 24). *U.S.A. suicide: 2016 official final data.* American Association of Suicidology. https://cdn.ymaws.com/www.palibraries.org/resource/collection/AAC7582D-A904-46B5-BC14-79385309AAEE/QPR_Data_Handout.pdf

Durà-Vilà, G., & Hodes, M. (2012). Cross-cultural study of idioms of distress among Spanish nationals and Hispanic American migrants: Susto, nervios and ataque de nervios. *Social Psychiatry and Psychiatric Epidemiology*, *47*(10), 1627–1637. https://doi.org/10.1007/s00127-011-0468-3.

Eack, S. M., Bahorik, A. L., Newhill, C. E., Neighbors, H. W., & Davis, L. E. (2012). Interviewer-perceived honesty as a mediator of racial disparities in the diagnosis of schizophrenia. *Psychiatric Services*, *63*(9), 875–880. https://doi.org/10.1176/appi.ps.201100388.

Endicott, J., & Spitzer, R. L. (1972). Current and past psychopathology scales (CAPPS): Rationale, reliability, and validity. *Archives of General Psychiatry*, *27*(5), 678–687. https://doi.org/10.1001/archpsyc.1972.01750290086015.

Endicott, J., & Spitzer, R. L. (1978). A diagnostic interview: The schedule for affective disorders and schizophrenia. *Archives of General Psychiatry*, *35*(7), 837–844. https://doi.org/10.1001/archpsyc.1978.01770310043002.

Fialko, L., Freeman, D., Bebbington, P. E., Kuipers, E., Garety, P. A., Dunn, G., & Fowler, D. (2006). Understanding suicidal ideation in psychosis: Findings from the Psychological Prevention of Relapse in Psychosis (PRP) trial. *Acta Psychiatrica Scandinavica*, *114*(3), 177–186. https://doi.org/10.1111/j.1600-0447.2006.00849.x

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. (1996). *Structured clinical interview for the DSM-IV axis I disorders.* American Psychiatric Press.

Fleischhacker, W. W., Kane, J. M., Geier, J., Karayal, O., Kolluri, S., Eng, S. M., Reynolds, R. F., & Strom, B. L. (2014). Completed and attempted suicides among 18,154 subjects with schizophrenia included in a large simple trial. *Journal of Clinical Psychiatry*, *75*(3), 184–190. https://doi.org/10.4088/JCP.13mO8563

Foley, S., Jackson, D., McWilliams, S., Renwick, L., Sutton, M., Turner, N., Kinsella, A., & O'Callaghan, E. (2008). Suicidality prior to presentation in first-episode psychosis. *Early Intervention in Psychiatry*, *2*(4), 242–246.

Fox, J. R., Gray, N. S., & Lewis, H. (2004). Factors determining compliance with command hallucinations with violent content: The role of social rank, perceived power of the voice and voice malevolence. *Journal of Forensic Psychiatry & Psychology*, *15*(3), 511–531. https://doi.org/10.1080/1478994042000226741

Freeman, D., Bold, E., Chadwick, E., Taylor, K. M., Collett, N., Diamond, R., Černis, E., Bird, J. C., Isham, L., Forkert, A., Carr, L., Causier, C., & Waite, F. (2019). Suicidal ideation and behaviour in patients with persecutory delusions: Prevalence, symptom associations, and psychological correlates. *Comprehensive Psychiatry*, *93*, 41–47. https://doi.org/10.1016/j.comppsych.2019.07.001

Freeman, A., Mergl, R., Kohls, E., Székely, A., Gusmao, R., Arensman, E., Koburger, N., Hegerl, U., & Rummel-Kluge, C. (2017). A cross-national study on gender differences in suicide intent. *BMC Psychiatry*, *17*(1), 1–12. https://doi.org/10.1186/s12888-017-1398-8

Fulginiti, A., & Brekke, J. S. (2016). Suicide attempt status and quality of life disparity among individuals with schizophrenia: A longitudinal analysis. *Journal of the Society for Social Work and Research*, *7*(2), 269–288. https://doi.org/10.1086/686645

Fuller-Thomson, E., & Hollister, B. (2016). Schizophrenia and suicide attempts: Findings from a representative community-based Canadian sample. *Schizophrenia Research and Treatment, 2016,* Article 3165243. https://www.hindawi.com/journals/schizort/2016/3165243/abs/

Gara, M. A., Vega, W. A., Arndt, S., Escamilla, M., Fleck, D. E., Lawson, W. B., Lesser, I., Neighbors, H. W., Wilson, D. R., Arnold, L. M., & Strakowski, S. M. (2012). Influence of patient race and ethnicity on clinical assessment in patients with affective disorders. *Archives of General Psychiatry*, *69*(6), 593–600.

Girón, M., Nova-Fernández, F., Mañá-Alvarenga, S., Nolasco, A., Molina-Habas, A., Fernández-Yañez, A., Tabarés-Seisdedos, R., & Gómez-Beneyto, M. (2015). How does family intervention improve the outcome of people with schizophrenia? *Social Psychiatry and Psychiatric Epidemiology*, *50*(3), 379–387. https://doi.org/10.1007/s00127-014-0942-9

Goodman, S. H., Sewell, D. R., Cooley, E. L., & Leavitt, N. (1993). Assessing levels of adaptive functioning: The Role Functioning Scale. *Community Mental Health Journal*, *29*(2), 119–131. doi: 10.1007/BF00756338

Grinker, R. R. E., Sr., & Harrow, M. E. (1987). *Clinical research in schizophrenia: A multidimensional approach*. Charles C Thomas.

Gupta, R., Narnoli, S., Das, N., Sarkar, S., Balhara, Y. P. S. (2019). Patterns and predictors of self-harm in patients with substance-use disorder. *Indian Journal of Psychiatry, 61*(5), 431-438. doi:10.4103/psychiatry.IndianJPsychiatry_578_18

Haglund, A., Lysell, H., Larsson, H., Lichtenstein, P., & Runeson, B. (2019). Suicide immediately after discharge from psychiatric inpatient care: A cohort study of nearly 2.9 million discharges. *The Journal of Clinical Psychiatry*, *80*(2), Article 18m12172.

Hamilton, M. (1960). A rating scale for depression. *Journal of Neurology, Neurosurgery and Psychiatry, 23*, 56–62.

Han, M., Huang, X. F., Xiu, M. H., Hui, L., Liu, H., Kosten, T. R., & Zhang, X. Y. (2012). Gender differences in cognitive function of patients with chronic schizophrenia. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *39*(2), 358–363.

Harris, J. G. (1975). An abbreviated form of the Phillips Rating Scale of Premorbid Adjustment in schizophrenia. *Journal of Abnormal Psychology*, *84*(2), 129–137.

Hart, S. A., Petrill, S. A., Deckard, K. D., & Thompson, L. A. (2007). SES and CHAOS as environmental mediators of cognitive ability: A longitudinal genetic analysis. *Intelligence*, *35*(3), 233–242.

Hassan, A. N., Stuart, E. A., & De Luca, V. (2016). Childhood maltreatment increases the risk of suicide attempt in schizophrenia. *Schizophrenia Research*, *176*(2-3), 572–577. https://doi.org/10.1016/j.schres.2016.05.012

Heilä, H., Isometsa, E. T., Henriksson, M. M., Heikkinen, M. E., Marttunen, M. J., & Lonnqvist, J. K. (1999). Suicide victims with schizophrenia in different treatment phases and adequacy of antipsychotic medication. *The Journal of Clinical Psychiatry*, *60*(3), 200–208. https://doi.org/10.4088/JCP.v60n0311

Heinrichs, D. W., Hanlon, T. E., & Carpenter, W. T., Jr. (1984). The Quality of Life Scale: An instrument for rating the schizophrenic deficit syndrome. *Schizophrenia Bulletin*, *10*(3), 388–398.

Hollingshead, A. B., & Redlich, F. C. (1958). *Social class and mental illness: A community study*. Wiley.

Høye, A., Jacobsen, B. K., & Hansen, V. (2011). Increasing mortality in schizophrenia: Are women at particular risk? A follow-up of 1,111 patients admitted during 1980-2006 in Northern Norway. *Schizophrenia Research*, *132*(2–3), 228–232. https://doi.org/10.1016/j.schres.2011.07.021

Jackson, J., Eaton, W., Cascella, N., Fasano, A., Warfel, D., Feldman, S., Richardson, C., Vyas, G., Linthicum, J., Santora, D., Warren, K. R., Carpenter, W. T., Jr., & Kelly, D. L. (2012, September). A gluten-free diet in people with schizophrenia and anti-tissue transglutaminase or anti-gliadin antibodies. *Schizophrenia Research, 140*(1–3), 262–263. https://doi.org/10.1016/j.schres.2012.06.011

Jakobsen, A. S., Speyer, H., Nørgaard, H. C. B., Karlsen, M., Hjorthøj, C., Krogh, J., Mores, O., Nordentoft, M., & Toft, U. (2018). Dietary patterns and physical activity in people with schizophrenia and increased waist circumference. *Schizophrenia Research*, *199*, 109–115. https://doi.org/10.1016/j.schres.2018.03.016

Jung, C. G. (1968). *Psychology and alchemy* (R. F. C. Hull, Trans.).

Kaplan, K. J., & Harrow, M. (1996). Positive and negative symptoms as risk factors for later suicidal activity in schizophrenics versus depressives. *Suicide and Life-Threatening Behavior*, *26*(2), 105–121.

Kaplan, K. J., & Harrow, M. (1999). Psychosis and functioning as risk factors for later suicidal activity among schizophrenia and schizoaffective patients: A disease-based interactive model. *Suicide & Life-Threatening Behavior*, *29*(1), 10–24. https://doi.org/10.1111/J.1943-278X.1999.TB00759.X

Kaplan, K. J., & Harrow, M. (2018). Social status and suicidal activity among psychiatric patients: Moderating effects of gender, race and psychiatric diagnosis. *Archives of Suicide Research*, *23*(4), 662–677.

Kaplan, K. J., Harrow, M., & Clews, K. (2016). The twenty-year trajectory of suicidal activity among post-hospital psychiatric men and women with mood disorders and schizophrenia. *Archives of Suicide Research*, *20*(3), 336–348. https://doi.org/10.1080/13811118.2015.1033505

Kaplan, K. J., Harrow, M., & Faull, R. N. (2012). Are there gender-specific risk factors for suicidal activity among patients with schizophrenia and depression? *Suicide and Life-Threatening Behavior*, *42*(6), 614–627. https://doi.org/10.1111/j.1943-278X.2012.00116.x

Karch, D. L., Barker, L., & Strine, T. W. (2006). Race/ethnicity, substance abuse, and mental illness among suicide victims in 13 U.S. states: 2004 data from the National Violent Death Reporting System. *Injury Prevention*, *12*(Suppl. 2), ii22–ii27. https://doi.org/10.1136/ip.2006.013557

Kay, S. R., Fiszbein, A., & Opler, L. A. (1987). The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophrenia Bulletin*, *13*(2), 261–276.

Kelly, D. L., Demyanovich, H. K., Rodriguez, K. M., Čiháková, D., Talor, M. V., McMahon, R. P., Richardson, C. M., Vyas, G., Adams, H. A., August, S. A., Fasano, A. Cascella, N. G., Feldman, S. M., Liu, F., Sayer, M. A., Powell, M. M., Wehring, H. J., Buchanan, R. W., Gold, J. M. … Eaton, W. W. (2019). Randomized controlled trial of a gluten-free diet in patients with schizophrenia positive for antigliadin antibodies (AGA IgG): A pilot feasibility study. *Journal of Psychiatry and Neuroscience*, *44*(4), 269–276. https://doi.org/10.1503/jpn.180174

Kelly, D. L., Rowland, L. M., Patchan, K. M., Sullivan, K., Earl, A., Raley, H., Liu, F., Feldman, S., & McMahon, R. P. (2016). Schizophrenia clinical symptom differences in women vs. men with and without a history of childhood physical abuse. *Child and Adolescent Psychiatry and Mental Health*, *10*(1), Article 5.

Kida, H., Niimura, H., Nemoto, T., Ryu, Y., Sakuma, K., Mimura, M., & Mizuno, M. (2020). Community transition at younger ages contributes to good cognitive function outcomes in long-term hospitalized patients with schizophrenia spectrum disorder: A 15-year follow-up study with group-based trajectory modeling. *Psychiatry and Clinical Neurosciences*, *74*(2), 105–111. https://doi.org/10.1111/pcn.12941

Kiliçaslan, E. E., Erol, A., Zengİn, B., ÇetİnayAydin, P., & Mete, L. (2014). Şizofreni başlangıç yaşı ile menarş yaşı arasındakiİlişki. *Noropsikiyatri Arsivi*, *51*(3), 211–215. https://doi.org/10.4274/npa.y6675

Kim, C. H., Jayathilake, K., & Meltzer, H. Y. (2003). Hopelessness, neurocognitive function, and insight in schizophrenia: Relationship to suicidal behavior. *Schizophrenia Research*, *60*(1), 71–80.

Kocatürk, B. K., Eşsizoglu, A., Aksaray, G., Akarsu, F. Ö., & Musmul, A. (2015). Relationship suicide, cognitive functions, and depression in patients with schizophrenia. *Nöro Psikiyatri Arşivi*, *52*(2), 169–173.

Kraepelin, E. (1893). *Psychiatrie: Ein lehrbuch fur studirende und aerzte* (4th ed.) J.A. Barth.

Kulkarni, J., Gavrilidis, E., Wang, W., Worsley, R., Fitzgerald, P. B., Gurvich, C., Van Rheenen, T., Berk, M., & Burger, H. (2015). Estradiol for treatment-resistant schizophrenia: A large-scale randomized-controlled trial in women of child-bearing age. *Molecular Psychiatry*, *20*(6), 695–702.

Lee, T. M. Y., Chong, S. A., Chan, Y. H., & Sathyadevan, G. (2004). Command hallucinations among Asian patients with schizophrenia. *Canadian Journal of Psychiatry*, *49*(12), 838–842. https://doi.org/10.1177/070674370404901207

Lewis, C. F., Tandon, R., Shipley, J. E., DeQuardo, J. R., Jibson, M., Taylor, S. F., & Goldman, M. (1996). Biological predictors of suicidality in schizophrenia. *Acta Psychiatrica Scandinavica*, *94*(6), 416–420. https://doi.org/10.1111/j.1600-0447.1996.tb09883.x

Lieberman, J. A., Stroup, T. S., McEvoy, J. P., Swartz, M. S., Rosenheck, R. A., Perkins, D. O., Keefe, R. S. E., Davis, S. M., Davis, C. E., Lebowitz, B. D., Severe, J., & Hsiao, J. K. (2005). Effectiveness of antipsychotic drugs in patients with chronic schizophrenia. *New England Journal of Medicine*, *353*(12), 1209–1223.

Limosin, F., Loze, J. Y., Philippe, A., Casadebaig, F., & Rouillon, F. (2007). Ten-year prospective follow-up study of the mortality by suicide in schizophrenic patients. *Schizophrenia Research*, *94*(1-3), 23-28. https://doi.org/10.1016/j.schres.2007.04.031

Lin, J. J., Liang, F. W., Li, C. Y., & Lu, T. H. (2018). Leading causes of death among decedents with mention of schizophrenia on the death certificates in the United States. *Schizophrenia Research, 97*, 116–123. https://doi.org/10.1016/j.schres.2018.01.011

Liu, T., Zhang, L., Pang, L., Li, N., & Zheng, X. (2015). Schizophrenia-related disability in China: Prevalence, gender, and geographic location. *Psychiatric Services*, *66*, 249–257. https://doi.org/10.1176/appi.ps.201400032

López-Moríñigo, J. D., Wiffen, B., O'Connor, J., Dutta, R., Di Forti, M., Murray, R. M., & David, A. S. (2014). Insight and suicidality in first-episode psychosis: Understanding the influence of suicidal history on insight dimensions at first presentation. *Early Intervention in Psychiatry*, *8*(2), 113–121.

Lyu, J., & Zhang, J. (2014). Characteristics of schizophrenia suicides compared with suicides by other diagnosed psychiatric disorders and those without a psychiatric disorder. *Schizophrenia Research*, *155*(1–3), 59–65. https://doi.org/10.1016/j.schres.2014.02.018

Mak, M., Tyburski, E., Starkowska, A., Karabanowicz, E., Samochowiec, A., & Samochowiec, J. (2019). The efficacy of computer-based cognitive training for executive dysfunction in schizophrenia. *Psychiatry Research*, *279*, 62–70.

McLean, D., Gladman, B., & Mowry, B. (2012). Significant relationship between lifetime alcohol use disorders and suicide attempts in an Australian schizophrenia sample. *Australian and New Zealand Journal of Psychiatry*, *46*(2), 132–140. https://doi.org/10.1177/0004867411433211

Mehl, S., Werner, D., & Lincoln, T. M. (2015). Does cognitive behavior therapy for psychosis (CBTp) show a sustainable effect on delusions? A meta-analysis. *Frontiers in Psychology*, *6*, Article 1450. https://doi.org/10.3389/fpsyg.2015.01450

Meltzer, H. Y., Alphs, L., Green, A. I., Altamura, A. C., Anand, R., Bertoldi, A., Bourgeois, M., Chouinard, G., Islam, M. Z., Kane, J., Krishnan, R., Lindenmayer, J. P., Potkin, S., & International Suicide Prevention Trial Study Group (2003). Clozapine treatment for suicidality in schizophrenia: International Suicide Prevention Trial (InterSePT). *Archives of General Psychiatry*, *60*(1), 82–91. https://doi.org/10.1001/archpsyc.60.1.82

Minsky, S., Vega, W., Miskimen, T., Gara, M., & Escobar, J. (2003). Diagnostic patterns in Latino, African American, and European American psychiatric patients. *Archives of General Psychiatry*, *60*(6), 637–644.

Motto, J. A., Heilbron, D. C., & Juster, R. P. (1985). Development of a clinical instrument to estimate suicide risk. *The American Journal of Psychiatry*, *142*(6), 680–686. https://doi.org/10.1176/ajp.142.6.680

National Institute of Mental Health. (2021, January). *Suicide*. https://www.nimh.nih.gov/health/statistics/suicide.shtml#part_155137

Nelson, H. E., & Willison, J. (1991). *National adult reading test (NART)*. Nfer-Nelson.

Ninan, P. T., Van Kammen, D. P., Scheinin, M., Linnoila, M., Bunney, W. E., & Goodwin, F. K. (1984). CSF 5-hydroxyindoleacetic acid levels in suicidal schizophrenic patients. *The American Journal of Psychiatry*, *141*(4), 566–569. https://doi.org/10.1176/ajp.141.4.566

Nopoulos, P., Flaum, M., & Andreasen, N. C. (1997). Sex differences in brain morphology in schizophrenia. *American Journal of Psychiatry*, *154*(12), 1648–1654.

Ohoshi, Y., Takahashi, S., Yamada, S., Ishida, T., Tsuda, K., Tsuji, T., Terada, M., Shinosaki, K., & Ukai, S. (2019). Microstructural abnormalities in callosal fibers and their relationship with cognitive function in schizophrenia: A tract-specific analysis study. *Brain and Behavior*, *9*(8), Article e01357.

Olfson, M., Gerhard, T., Huang, C., Crystal, S., & Stroup, T. S. (2015). Premature mortality among adults with schizophrenia in the United States. *JAMA Psychiatry*, *72*(12), 1172–1181. https://doi.org/10.1001/jamapsychiatry.2015.1737

Østergaard, M. L. D., Nordentoft, M., & Hjorthøj, C. (2017). Associations between substance use disorders and suicide or suicide attempts in people with mental illness: A Danish nation-wide, prospective, register-based study of patients diagnosed with schizophrenia, bipolar disorder, unipolar depression or personal. *Addiction*, *112*(7), 1250–1259. https://doi.org/10.1111/add.13788

Overall, J. E., & Gorham, D. R. (1962). The brief psychiatric rating scale. *Psychological Reports*, *10*(3), 799–812.

Posner, K., Brown, G. K., Stanley, B., Brent, D. A., Yershova, K. V., Oquendo, M. A., Currier, G. W., Melvin, G. A., Greenhill, L., Shen, S., & Mann, J. J. (2011). The Columbia-Suicide Severity Rating Scale: Initial validity and internal consistency findings from three multisite studies with adolescents and adults. *American Journal of Psychiatry*, *168*(12), 1266–1277. https://doi.org/10.1176/appi.ajp.2011.10111704

Pluck, G., Lekka, N. P., Sarkar, S., Lee, K. H., Bath, P. A., Sharif, O., & Woodruff, P. W. R. (2013). Clinical and neuropsychological aspects of non-fatal self-harm in schizophrenia. *European Psychiatry*, *28*(6), 344–348. https://doi.org/10.1016/j.eurpsy.2012.08.003

Qurashi, I., Chaudhry, I. B., Khoso, A. B., Farooque, S., Lane, S., Husain, M. O., Chu, S., Sarginson, J., Hamarani, M., Naqvi, H. A., Razzaque, B., Minhas, F. A., Yung, A. R., Deakin, J. F. W., & Husain, N. (2017). A randomised, double-blind, placebo-controlled trial of minocycline and/or omega-3 fatty acids added to treatment as usual for at-risk mental states (NAYAB): Study protocol. *Trials*, *18*(1), Article 524. https://doi.org/10.1186/s13063-017-2275-y

Ray, P., Nikhiles, M., & Sinha, V. K. (2019). Change of symptoms of schizophrenia across phases of menstrual cycle. *Archives of Women's Mental Health, 23,* 113–122.

Reichenberg, A., Weiser, M., Rapp, M. A., Rabinowitz, J., Caspi, A., Schmeidler, J., Knobler, H. Y., Lubin, G., Nahon, D., Harvey, P. D., & Davidson, M. (2005). Elaboration on premorbid intellectual performance in schizophrenia: Premorbid intellectual decline and risk for schizophrenia. *Archives of General Psychiatry*, *62*(12), 1297–1304.

Richardson, T., Dasyam, B., Courtney, H., White, L., Tedbury, J., Butt, J., & Newman-Taylor, K. (2019). Predictors of disengagement from cognitive behavioural therapy for psychosis in a National Health Service setting: A retrospective evaluation. *British Journal of Clinical Psychology*, *58*(4), 440–451. https://doi.org/10.1111/bjc.12222

Rindermann, H., Flores-Mendoza, C., & Mansur-Alves, M. (2010). Reciprocal effects between fluid and crystallized intelligence and their dependence on parents' socioeconomic status and education. *Learning and Individual Differences*, *20*(5), 544–548.

Rudd, M. D., Mandrusiak, M., & Joiner, T. E. (2006). The case against no-suicide contracts: The commitment to treatment statement as a practice alternative. *Journal of Clinical Psychology, 62*(2), 243–251. https://doi.org/10.1002/jclp.20227

Saarinen, P. I., Lehtonen, J., & Lonnqvist, J. (1999). Suicide risk in schizophrenia: An analysis of 17 consecutive suicides. *Schizophrenia Bulletin*, *25*(3), 533–542. https://doi.org/10.1093/oxfordjournals.schbul.a033399

Schneider, K. (1939). *Psychischer befund und psychiatrische diagnose*. Thieme.

Schwartz, R. C., & Feisthamel, K. P. (2009). Disproportionate diagnosis of mental disorders among African American versus European American clients: Implications for counseling theory, research, and practice. *Journal of Counseling & Development*, *87*(3), 295–301.

Sheehan, D. V., Lecrubier, Y., Harnett-Sheehan, K., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R., Dunbar, G. (1998). The mini international neuropsychiatric interview (M.I.N.I): The development and validation of a structured diagnostic psychiatric interview. *Journal of Clinical Psychiatry, 59*(Suppl. 20), 22-33. http://www.psychiatrist.com/JCP/article/Pages/1998/v59s20/v59s2005.aspx

Shtasel, D. L., Gur, R. E., Gallacher, F., Heimberg, C., & Gur, R. C. (1992). Gender differences in the clinical expression of schizophrenia. *Schizophrenia Research*, *7*(3), 225–231.

Silva, B. A. E., Cassilhas, R. C., Attux, C., Cordeiro, Q., Gadelha, A. L., Telles, B. A., Bressan R. A., Ferreira, F. N., Rodstein, P. H., Daltio C. S., Tufik, S., & de Mello, M. T. (2015). A 20-week program of resistance or concurrent exercise improves symptoms of schizophrenia: Results of a blind, randomized controlled trial. *Revista Brasileira de Psiquiatria*, *37*(4), 271–279. https://doi.org/10.1590/1516-4446-2014-1595

Simms, J., McCormack, V., Anderson, R., & Mulholland, C. (2007). Correlates of self-harm behaviour in acutely ill patients with schizophrenia. *Psychology and Psychotherapy: Theory, Research and Practice*, *80*(1), 39–49. https://doi.org/10.1348/147608306X99386

Sitko, K., Bewick, B. M., Owens, D., & Masterson, C. (2020). Meta-analysis and meta-regression of cognitive behavioral therapy for psychosis (CBTp) across time: The effectiveness of CBTp has improved for delusions. *Schizophrenia Bulletin Open*, *1*(1), Article sgaa023. https://doi.org/10.1093/schizbullopen/sgaa023

Sivrioglu, E. Y., Kirli, S., Sipahioglu, D., Gursoy, B., & Sarandöl, E. (2007). The impact of ω-3 fatty acids, vitamins E and C supplementation on treatment outcome and side effects in schizophrenia patients treated with haloperidol: An open-label pilot study. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *31*(7), 1493–1499. https://doi.org/10.1016/j.pnpbp.2007.07.004

Spitzer, R. L., Endicott, J., & Robins, E. (1978). Research diagnostic criteria: Rationale and reliability. *Archives of General Psychiatry*, *35*(6), 773–782.

Spitzer, R. L., Williams, J. B., Gibbon, M., & First, M. B. (1992). The Structured Clinical Interview for DSM-III-R (SCID). I: History, rationale, and description. *Archives of General Psychiatry, 49*(8), 624 –629.

Steil, R., Dyer, A., Priebe, K., Kleindienst, N., & Bohus, M. (2011). Dialectical behavior therapy for posttraumatic stress disorder related to childhood sexual abuse: A pilot study of an intensive residential treatment program. *Journal of Traumatic Stress*, *24*(1), 102–106. https://doi.org/10.1002/jts.20617

Subica, A. M., Allen, J. G., Frueh, B. C., Elhai, J. D., & Fowler, J. C. (2016). Disentangling depression and anxiety in relation to neuroticism, extraversion, suicide, and self-harm among adult psychiatric inpatients with serious mental illness. *British Journal of Clinical Psychology, 55*(4), 349–370. https://doi-org.nl.idm.oclc.org/10.1111/bjc.12098

Sweeting, J., Duflou, J., & Semsarian, C. (2013). Postmortem analysis of cardiovascular deaths in schizophrenia: A 10-year review. *Schizophrenia Research, 150*(2–3), 398–403. https://doi.org/10.1016/j.schres.2013.08.029

Tang, Y.-L., Gillespie, C. F., Epstein, M. P., Mao, P.-X., Jiang, F., Chen, Q., Cai, Z., & Mitchell, P. B. (2007). Gender differences in 542 Chinese inpatients with schizophrenia. *Schizophrenia Research*, *97*(1–3), 88–96. https://doi.org/10.1016/j.schres.2007.05.025

Tang, X., Zhou, C., Gao, J., Duan, W., Yu, M., Xiao, W., Zhang, X., Dong, H., Wang, X., & Zhang, X. (2019). Serum BDNF and GDNF in Chinese male patients with deficit schizophrenia and their relationships with neurocognitive dysfunction. *BMC Psychiatry*, *19*(1), Article 254.

Thomas, M., & Rusten, K. (2019). Trial implementation of CIRCuiTS cognitive remediation therapy for people with schizophrenia in Orange, New South Wales. *Australian Journal of Rural Health*, *27*(5), 463–468. https://doi.org/10.1111/ajr.12578

Trierweiler, S. J., Neighbors, H. W., Thompson, E. E., Munday, C., Jackson, J. S., & Binion, V. J. (2006). Differences in patterns of symptom attribution in diagnosing schizophrenia between African American and non-African American clinicians. *American Journal of Orthopsychiatry*, *76*(2), 154–160.

Turkington, D., Kingdon, D., & Turner, T. (2002). Effectiveness of a brief cognitive-behavioural therapy intervention in the treatment of schizophrenia. *British Journal of Psychiatry*, *180*, 523–527. https://doi.org/10.1192/bjp.180.6.523.

Üçok, A., & Bıkmaz, S. (2007). The effects of childhood trauma in patients with first-episode schizophrenia. *Acta Psychiatrica Scandinavica*, *116*(5), 371–377.

Umut, G., Altun, Z. O., Danismant, B. S., Kucukparlak, I., Karamustafalioglu, N., & Ilnem, M. C. (2013). The correlation of suicide attempt and suicidal ideation with insight, depression and severity of illness in schizophrenic patients. *Dusunen Adam*, *26*(4), 341–350. https://doi.org/10.5350/DAJPN2013260403.

Usall, J., Araya, S., Ochoa, S., Busquets, E., Gost, A., Marquez, M., & Assessment Research Group in Schizophrenia (NEDES). (2001). Gender differences in a sample of schizophrenic outpatients. *Comprehensive Psychiatry*, *42*(4), 301–305.

U.S. Census Bureau. (2017). *Hispanic population to reach 111 million by 2060*. https://www.census.gov/library/visualizations/2018/comm/hispanic-projected-pop.html.

Villa, J., Choi, J., Kangas, J. L., Kaufmann, C. N., Harvey, P. D., & Depp, C. A. (2018). Associations of suicidality with cognitive ability and cognitive insight in outpatients with Schizophrenia. *Schizophrenia Research*, *192*, 340–344.

Virkkunen, M., De Jong, J., Bartko, J., Goodwin, F. K., & Linnoila, M. (1989). Relationship of psychobiological variables to recidivism in violent offenders and impulsive fire setters: A follow-up study. *Archives of General Psychiatry*, *46*(7), 600–603.

Webb, R. T., Långström, N., Runeson, B., Lichtenstein, P., & Fazel, S. (2011). Violent offending and IQ level as predictors of suicide in schizophrenia: National cohort study. *Schizophrenia Research*, *130*(1-3), 143–147. https://doi.org/10.1016/j.schres.2011.04.031

Wechsler, D. (1981). WAIS-R: Wechsler adult intelligence scale (Rev. ed.). Psychological Corporation.

Weech-Maldonado, R., Elliott, M., Pradhan, R., Schiller, C., Hall, A., & Hays, R. D. (2012). Can hospital cultural competency reduce disparities in patient experiences with care?. *Medical Care*, *50*(Suppl. 3), S48–S55. https://doi.org/10.1097/MLR.0b013e3182610ad1

Weiser, M., Kapra, O., Werbeloff, N., Goldberg, S., Fenchel, D., Reichenberg, A., Yoffe, R., Ginat, K., Fruchter E., & Davidson, M. (2015). A population-based longitudinal study of suicide risk in male schizophrenia patients: Proximity to hospital discharge and the moderating effect of premorbid IQ. *Schizophrenia Research*, *169*(1-3), 159–164.

Westermeyer, J. F., & Harrow, M. (1989). Early phases of schizophrenia and depression: Prediction of suicide. In *Depression in Schizophrenics* (pp. 153–169). Springer.

Whaley, A. L. (2001). Cultural mistrust and the clinical diagnosis of paranoid schizophrenia in African American patients. *Journal of Psychopathology and Behavioral Assessment*, *23*(2), 93–100.

Wing, J. K., Birley, J. L. T., Cooper, J. E., Graham, P., & Isaacs, A. D. (1967). Reliability of a procedure for measuring and classifying "present psychiatric state." *The British Journal of Psychiatry*, *113*(498), 499–515.

World Health Organization. (1949). *International classification of diseases and related health problems* (6th ed.). World Health Organization.

World Health Organization. (1965). *International classification of diseases and related health problems* (8th ed.). World Health Organization.

World Health Organization. (1967). *Manual of the international statistical classification of disease, injuries, and causes of death. Based on the recommendations of the eighth revision conference, 1965, and adopted by the Nineteenth World Health Assembly.* World Health Organization.

World Health Organization. (1978). *International classification of diseases and related health problems* (9th ed.). World Health Organization.

World Health Organization. (1988). *WHO psychiatric disability assessment schedule.* World Health Organization.

World Health Organization. (1992). *International classification of diseases and related health problems* (10th ed.). World Health Organization.

World Health Organization. (2018, April 9). *Schizophrenia.* https://www.who.int/news-room/fact-sheets/detail/schizophrenia

Xiu, M. H., Wang, D., Du, X. D., Chen, N., Tan, S. P., Tan, Y. L., Yang, F. D., Cho, R. Y., & Zhang, X. Y. (2019). Interaction of BDNF and cytokines in executive dysfunction in patients with chronic schizophrenia. *Psychoneuroendocrinology, 108,* 110–117.

Yan, F., Xiang, Y.-T., Hou, Y.-Z., Ungvari, G. S., Dixon, L. B., Chan, S. S. M., Lee, E. H. M., Li, W.-Y. Li, W.-X., Zhu, Y.-L., & Chiu, H. F. K. (2013). Suicide attempt and suicidal ideation and their associations with demographic and clinical correlates and quality of life in Chinese schizophrenia patients. *Social Psychiatry and Psychiatric Epidemiology*, *48*(3), 447–454. https://doi.org/10.1007/s00127-012-0555-0

Yang, X., Liu, D., Wang, Y., Chen, Y., Chen, W., Yang, C., Zhang, P., Ding, S., & Zhang, X. (2020). Effectiveness of Zhong-Yong thinking based dialectical behavior therapy group skills training versus supportive group therapy for lowering suicidal risks in Chinese young adults: A randomized controlled trial with a 6-month follow-up. *Brain and Behavior*, *10*(6), Article e01621. https://doi.org/10.1002/brb3.1621

Zammit, S., Allebeck, P., David, A. S., Dalman, C., Hemmingsson, T., Lundberg, I., & Lewis, G. (2004). A longitudinal study of premorbid IQ score and risk of developing schizophrenia, bipolar disorder, severe depression, and other nonaffective psychoses. *Archives of General Psychiatry*, *61*(4), 354–360.

Zhang, Z., Zhai, J., Wei, Q., Qi, J., Guo, X., & Zhao, J. (2014). Cost-effectiveness analysis of psychosocial intervention for early stage schizophrenia in China: A randomized, one-year study. *BMC Psychiatry*, *14*(1), Article 212. https://doi.org/10.1186/s12888-014-0212-0

Zonana, J., Simberlund, J., & Christos, P. (2018). The impact of safety plans in an outpatient clinic. *Crisis*, *39*(4), 304–309. https://doi.org/10.1027/0227-5910/a000495